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Marvin & Associates
Traffic safety improvement study

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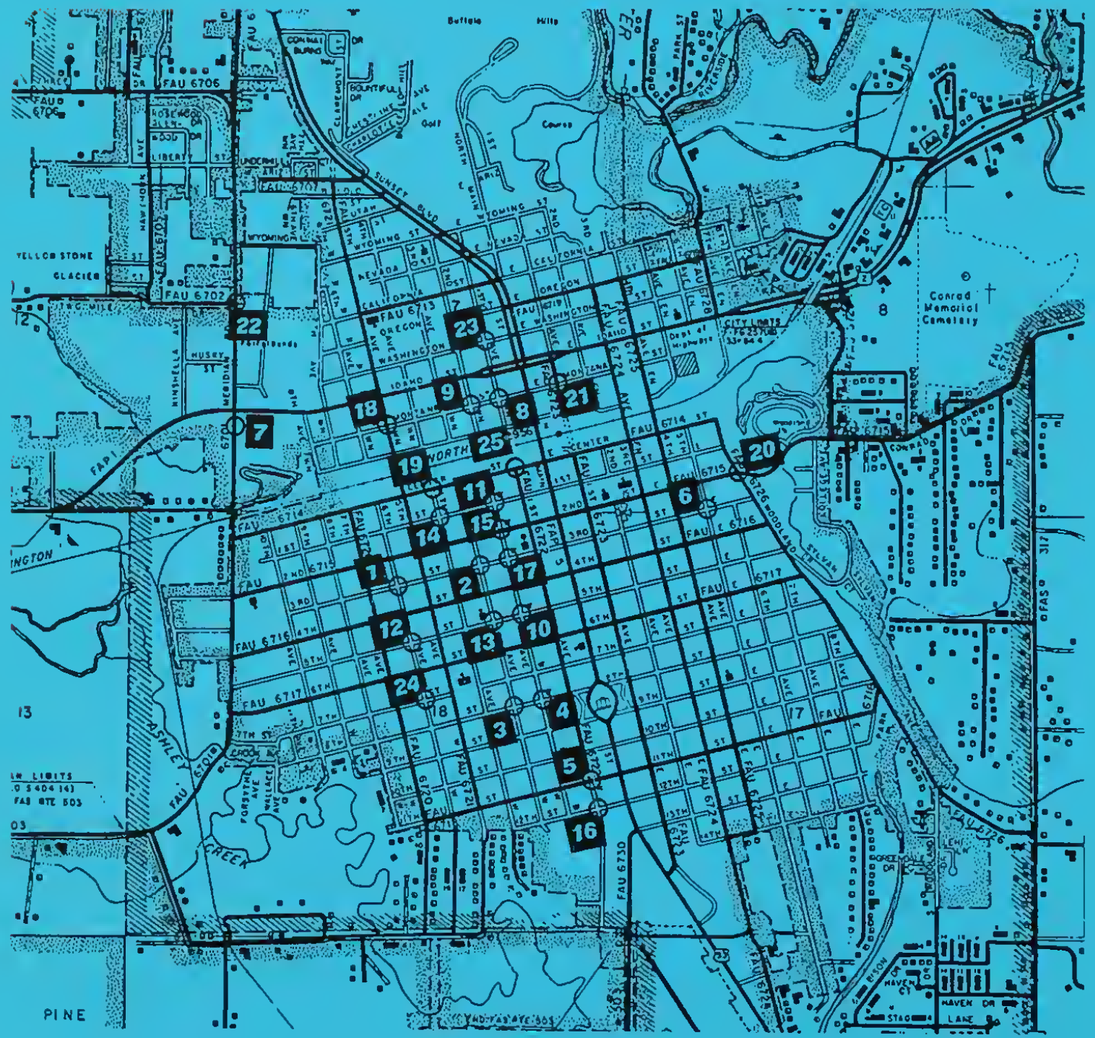
TRAFFIC SAFETY IMPROVEMENT STUDY



LOCATION MAP

SHEET INDEX

DESCRIPTION			SHEET NUMBERS	
PLAN LEGEND			1	
SIGNING & PAVEMENT MARKING KEY			2 & 3	
PLAN SHEETS BY PRIORITY:			EXISTING CONDITION	SHORT TERM IMPROVEMENT
1	SIXTH AVE. W.	THIRD ST.	4	5
2	THIRD AVE. W.	THIRD ST.	6	7
3	THIRD AVE. W.	EIGHTH ST.	8	9
4	SECOND AVE. W.	EIGHTH ST.	10	11
5	FIRST AVE. W.	ELEVENTH ST.	12	13
6	FIFTH AVE. E.	THIRD ST.	14	15
7	MERIDIAN ROAD	BUTTREY'S ACCESS	16	17
8	FIRST AVE. W.	MONTANA ST.	18	19
9	SECOND AVE. W.	MONTANA ST.	20	21
10	SECOND AVE. W.	FIFTH ST.	22	23
11	SECOND AVE. W.	FIRST ST.	24	25
12	SIXTH AVE. W.	FIFTH ST.	26	27
13	THIRD AVE. W.	FIFTH ST.	28	29
14	FOURTH AVE. W.	FIRST ST.	30	31
15	SECOND AVE. W.	SECOND ST.	32	33
16	FIRST AVE. W.	TWELFTH ST.	34	35
17	SECOND AVE. W.	THIRD ST.	36	37
18	FIFTH AVE. W.	MONTANA ST.	38	39
19	FOURTH AVE. W.	CENTER ST.	40	41
20	WOODLAND DRIVE	SECOND ST.	42	43
21	FIRST AVE. E.	MONTANA ST.	44	45
22	MERIDIAN ROAD	TWO MILE ROAD	46	47
23	FIRST AVE. W.	WASHINGTON ST.	48	49
24	SIXTH AVE. W.	SEVENTH ST.	50	51
25	FIRST AVE. W.	CENTER ST.	52	53

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1127 Alderson Ave. #204
Billings, MT 59102

EXISTING CONDITIONS & SHORT TERM IMPROVEMENTS

VOLUME II - PLAN SHEETS

MONTANA STATE LIBRARY
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Traffic safety improvement study /
3 0864 00082726 4

LEGEND

- CURB & GUTTER
- YELLOW CURB PAINT
- EDGE OF PAVED STREET
- SIDEWALK
- FIRE HYDRANT
- POWER POLE
- POWER POLE WITH STREET LIGHT
- LIGHT POLE
- TREE
- HEDGE
- SHRUB
- BUSHES
- MAILBOX
- EXISTING SIGN
- NEW SIGN
- TRAFFIC SIGNAL POLE & SIGNALS
- PROPERTY LINE
- CHAIN LINK FENCE
- WOOD FENCE
- WIRE FENCE
- ORNAMENTAL IRON FENCE
- ROCK WALL
- EXISTING BUILDING

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EXISTING CONDITION &
SHORT TERM IMPROVEMENTS

LEGEND TO DRAWINGS

SHEET 1

R1-1
30"X30"
(Unless Otherwise Noted)

R1-2
36"x36"x36"

R7-3ar
12"x18"

R7-3al
12"x18"

R7-1l
12"x18"

R7-1
12"x18"

R7-1r
12"x18"

R3-5l
30"x36"

R3-5
30"x36"

R3-5r
30"x36"

R3-7r
30"x30"

R3-1r
24"x24"

R5-1
30"x30"

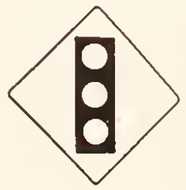
R9-3a
18"x18"

W3-1a
30"x30"

S1-1
36"x36"

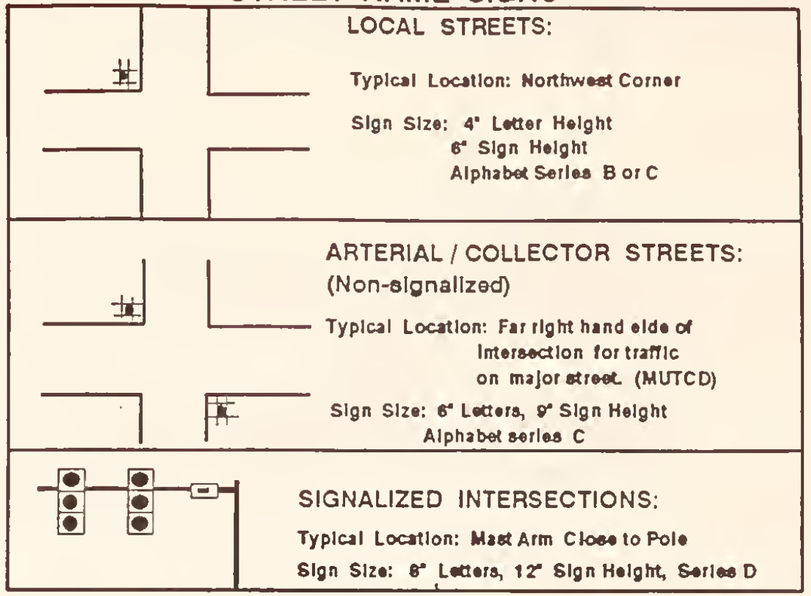
S2-1
36"x36"

S2-1p
36"x18"

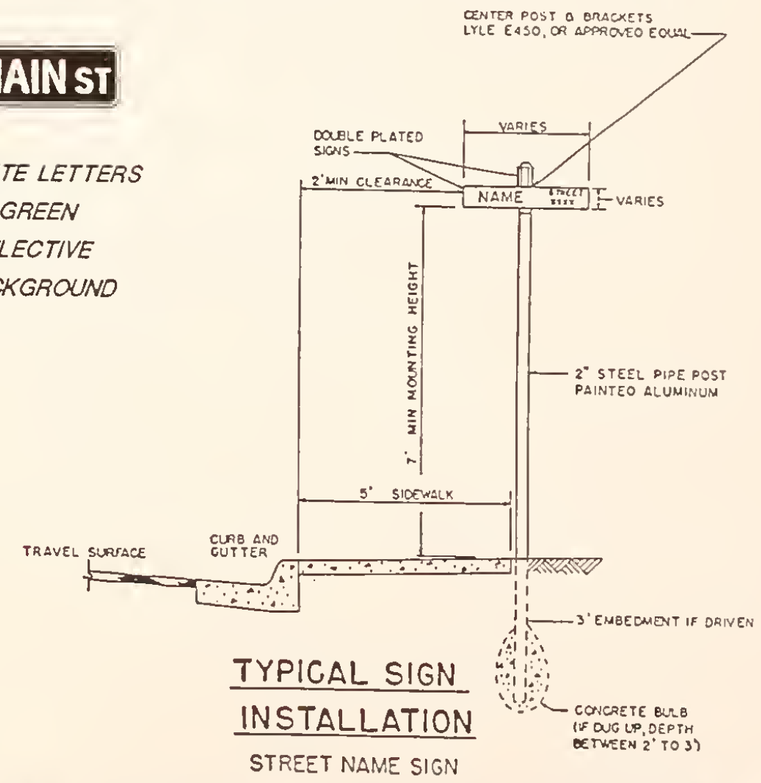


W3-3
36"x36"

STREET NAME SIGNS



WHITE LETTERS
ON GREEN
REFLECTIVE
BACKGROUND



TYPICAL SIGN INSTALLATION

STREET NAME SIGN

MARVIN & ASSOCIATES
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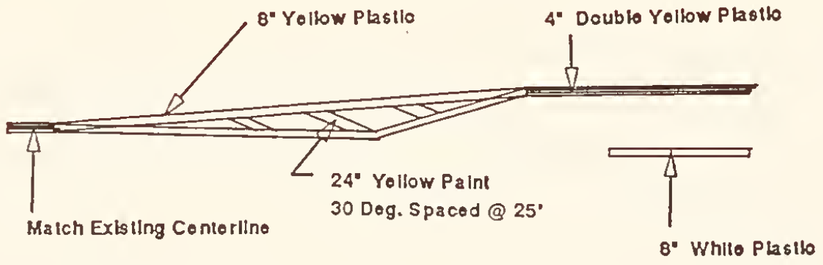
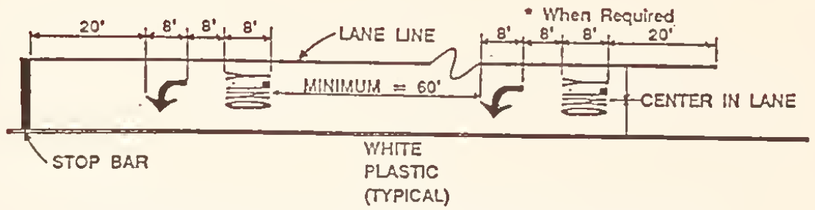
1127 Alderson Ave. #204
Billings, MT 59102

SHORT TERM IMPROVEMENTS

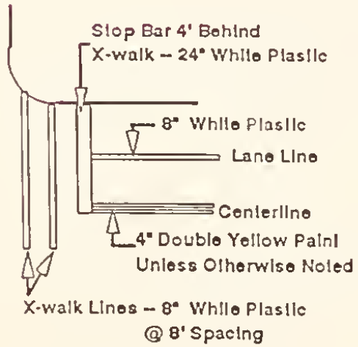
SIGNING KEY



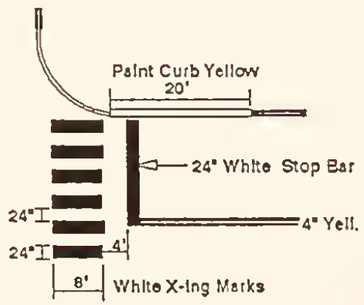
TYPICAL CENTER DIVIDER ISLAND MARKS



TYPICAL WORDS & SYMBOLS LAYOUT



TYPICAL INTERSECTION MARKS



TYPICAL SCHOOL X-ING MARKINGS

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1127 Alderson Ave. #204
Billings, MT 59102

SHORT TERM IMPROVEMENTS

PAVEMENT MARKING KEY

SHEET 3

All Gardes < 2%

SCALE: 1" = 40'

35' BC-BC

ADT = 300

RESIDENCE

St. Name Signs

ALLEY

RESIDENCE

ALLEY

ADT = 500

37' BC-BC

THIRD STREET

ADT = 500

ALLEY

RESIDENCE

RESIDENCE

ALLEY

SIXTH AVENUE WEST

ADT = 300

6th AVE W

North

#3

#4,6

3rd ST

#1,2,5, 7,8,9

#3,4 = Accident Reference Numbers

COLLISION DIAGRAM

SIXTH AVE. W

1 12 2 — 3 Peds

6 Peds

3 1

13 23 THIRD ST

0 4

3 Peds

0 Peds

4 7 1

TRAFFIC MOVEMENTS 2:00 - 3:00 PM 9/30/92

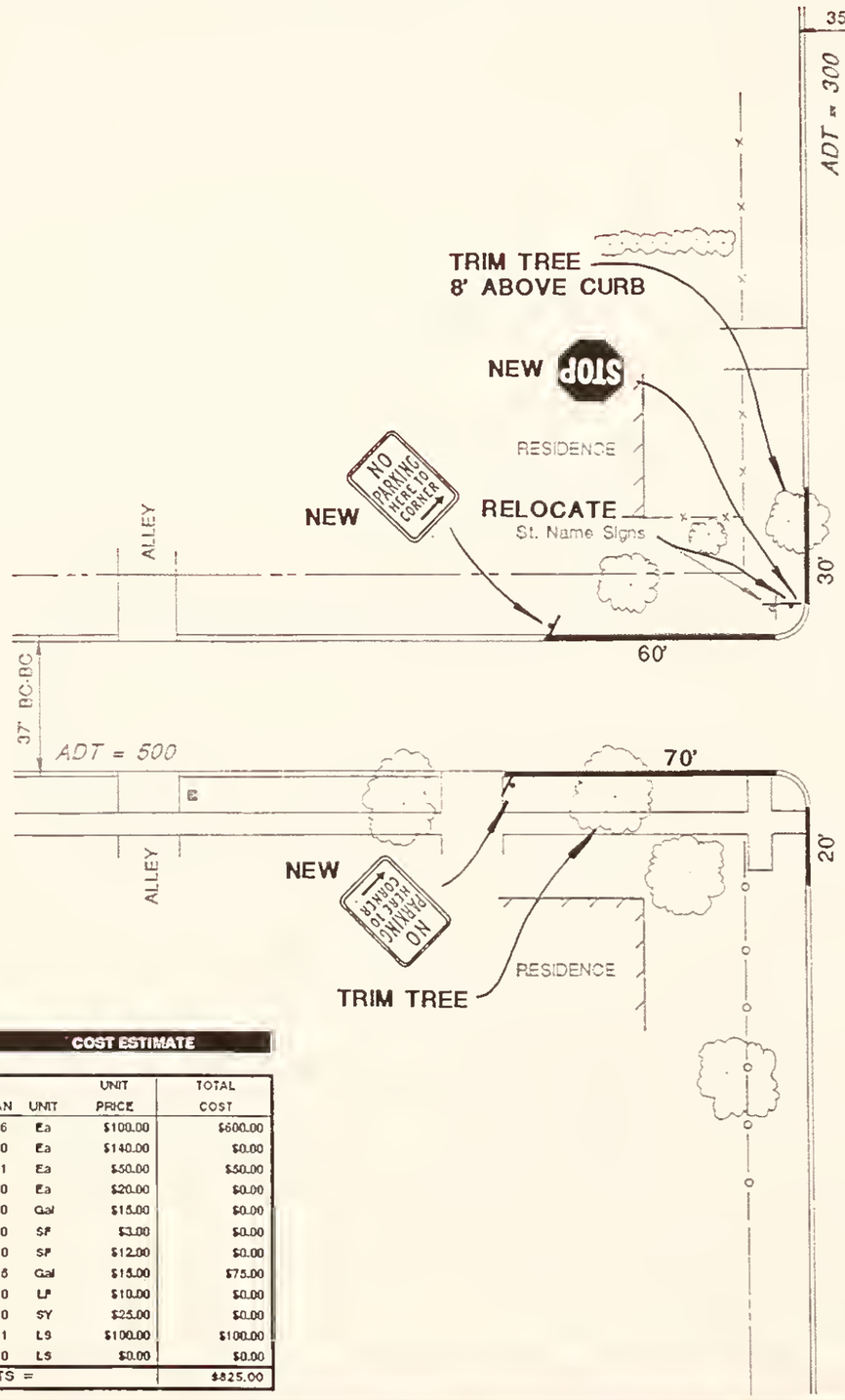
MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

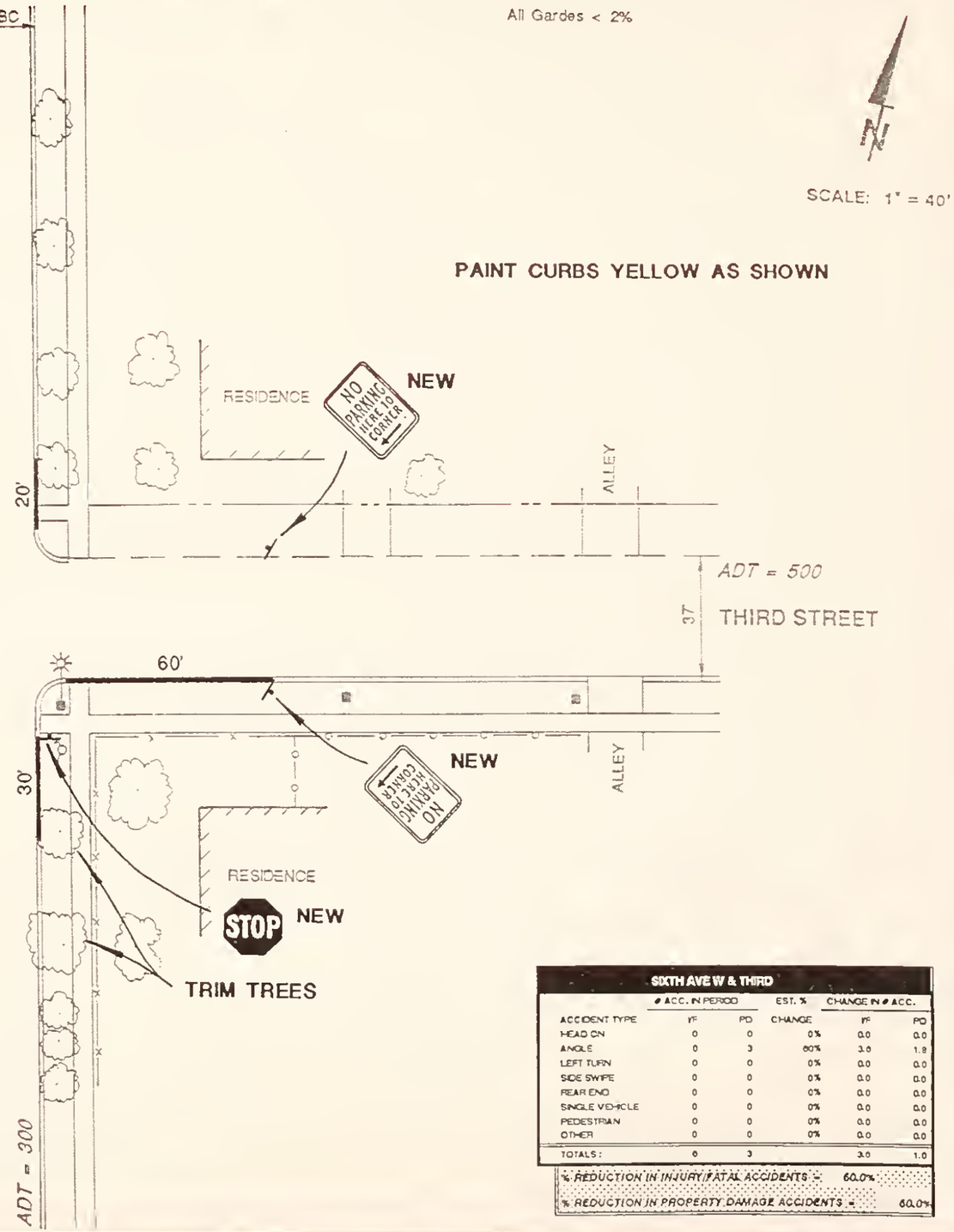
1127 Alderson Ave. #204
Billings, MT 59102

SIXTH AVENUE WEST & THIRD STREET

EXISTING CONDITIONS

SHEET 4





SIXTH AVE. & THIRD ST. — COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (.6 SF)	6	Ea	$100.00	$600.00
2	NEW SIGNS (6.1 to 10 SF)	0	Ea	$140.00	$0.00
3	RELOCATE SIGNS	1	Ea	$50.00	$50.00
4	REMOVE SIGNS	0	Ea	$20.00	$0.00
5	PAVE. MARKINGS (PAINT)	0	Gal	$15.00	$0.00
6	PAVE. MARKING PLASTIC	0	SF	$3.00	$0.00
7	PLASTIC WORDS & SYMBOLS	0	SF	$12.00	$0.00
8	CURB PAINT - YELLOW	5	Gal	$15.00	$75.00
9	NEW CURB & GUTTER	0	LF	$10.00	$0.00
10	NEW SIDEWALK	0	SY	$25.00	$0.00
11	TRIM TREES	1	LS	$100.00	$100.00
12	MISCELLANEOUS	0	LS	$0.00	$0.00
	TOTAL CONSTRUCTION COSTS =				$825.00

SIXTH AVE W & THIRD

ACCIDENT TYPE	# ACC. IN PERIOD		EST. % CHANGE	CHANGE IN # ACC.	
	PF	PD		PF	PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	0	3	60%	3.0	1.8
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	0	0%	0.0	0.0
REAR END	0	0	0%	0.0	0.0
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	0	0%	0.0	0.0
TOTALS:	0	3		3.0	1.0

% REDUCTION IN INJURY/FATAL ACCIDENTS = 60.0%

% REDUCTION IN PROPERTY DAMAGE ACCIDENTS = 60.0%

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers
1127 Alderson Ave. #204
Billings, MT 59102

SIXTH AVENUE WEST & THIRD STREET

SHORT TERM IMPROVEMENTS

SHEET 5

All Grades < 2%

SCALE: 1" = 40'

32' BC-BC

ADT = 550

Parking Lot

Apertments

St. Name Signs

ALLEY

Apartments

ALLEY

ADT = 1300

THIRD STREET

32' BC-BC

ADT = 1200

ALLEY

Retirement Home

7:00 AM To 6:00 PM

SPEED LIMIT 15

SCHOOL

RESIDENCE

ALLEY

THIRD AVENUE WEST

ADT = 550

3rd AVE W

North

#1,2

#3,4,5,6,7 6,9,10

3rd ST.

#3,4 = Accident Reference Numbers

COLLISION DIAGRAM

THIRD AVE W

3 24 13

5 Peds

24 Peds

1 2

37 61 THIRD ST

7 7

1 Peds

0 Peds

4 7 2

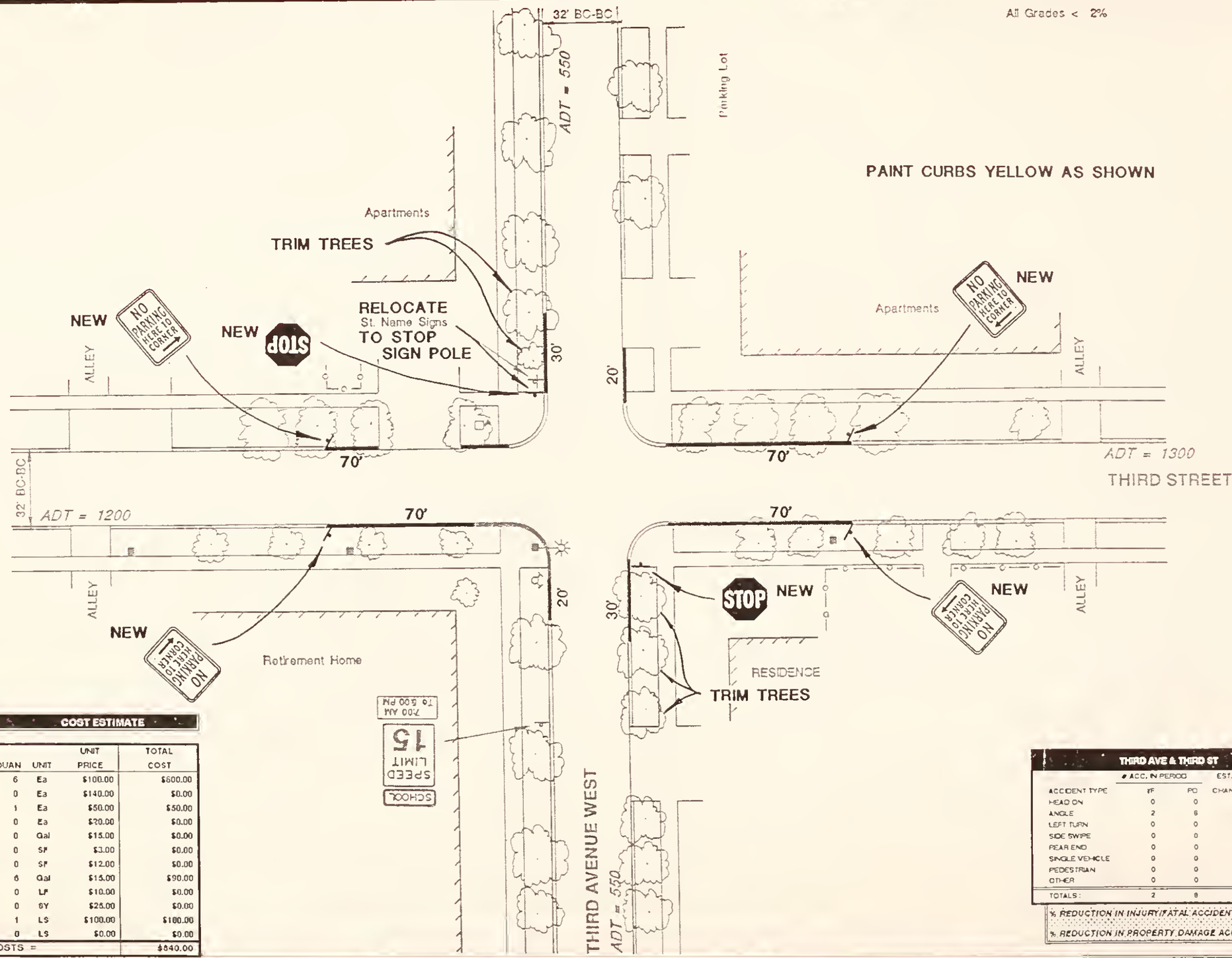
TRAFFIC MOVEMENTS 1:00 - 2:00 PM 9/30/92

MARVIN & ASSOCIATES Traffic, Transportation & Civil Engineers	1127 Alderson Ave. #204 Billings, MT 59102	THIRD AVENUE WEST & THIRD STREET	EXISTING CONDITIONS SHEET 6

All Grades < 2%

SCALE: 1" = 40'

PAINT CURBS YELLOW AS SHOWN



THIRD AVE. W & THIRD ST. — COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (,6 SF)	6	Ea	$100.00	$600.00
2	NEW SIGNS (6.1 to 10 SF)	0	Ea	$140.00	$0.00
3	RELOCATE SIGNS	1	Ea	$50.00	$50.00
4	REMOVE SIGNS	0	Ea	$20.00	$0.00
5	PAVE. MARKINGS (PAINT)	0	Gal	$15.00	$0.00
6	PAVE. MARKING PLASTIC	0	SF	$3.00	$0.00
7	PLASTIC WORDS & SYMBOLS	0	SF	$12.00	$0.00
8	CURB PAINT - YELLOW	6	Gal	$15.00	$90.00
9	NEW CURB & GUTTER	0	LF	$10.00	$0.00
10	NEW SIDEWALK	0	SY	$25.00	$0.00
11	TRIM TREES	1	LS	$100.00	$100.00
12	MISCELLANEOUS	0	LS	$0.00	$0.00
	TOTAL CONSTRUCTION COSTS =				$840.00

THIRD AVE & THIRD ST

	# ACC. IN PERIOD		EST. %	CHANGE IN # ACC.	
ACCIDENT TYPE	YF	PD	CHANGE	YF	PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	2	8	60%	1.2	4.8
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	0	0%	0.0	0.0
REAR END	0	0	0%	0.0	0.0
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	0	0%	0.0	0.0
TOTALS:	2	8		1.2	4.8

% REDUCTION IN INJURY/FATAL ACCIDENTS = 60.0%

% REDUCTION IN PROPERTY DAMAGE ACCIDENTS = 60.0%

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

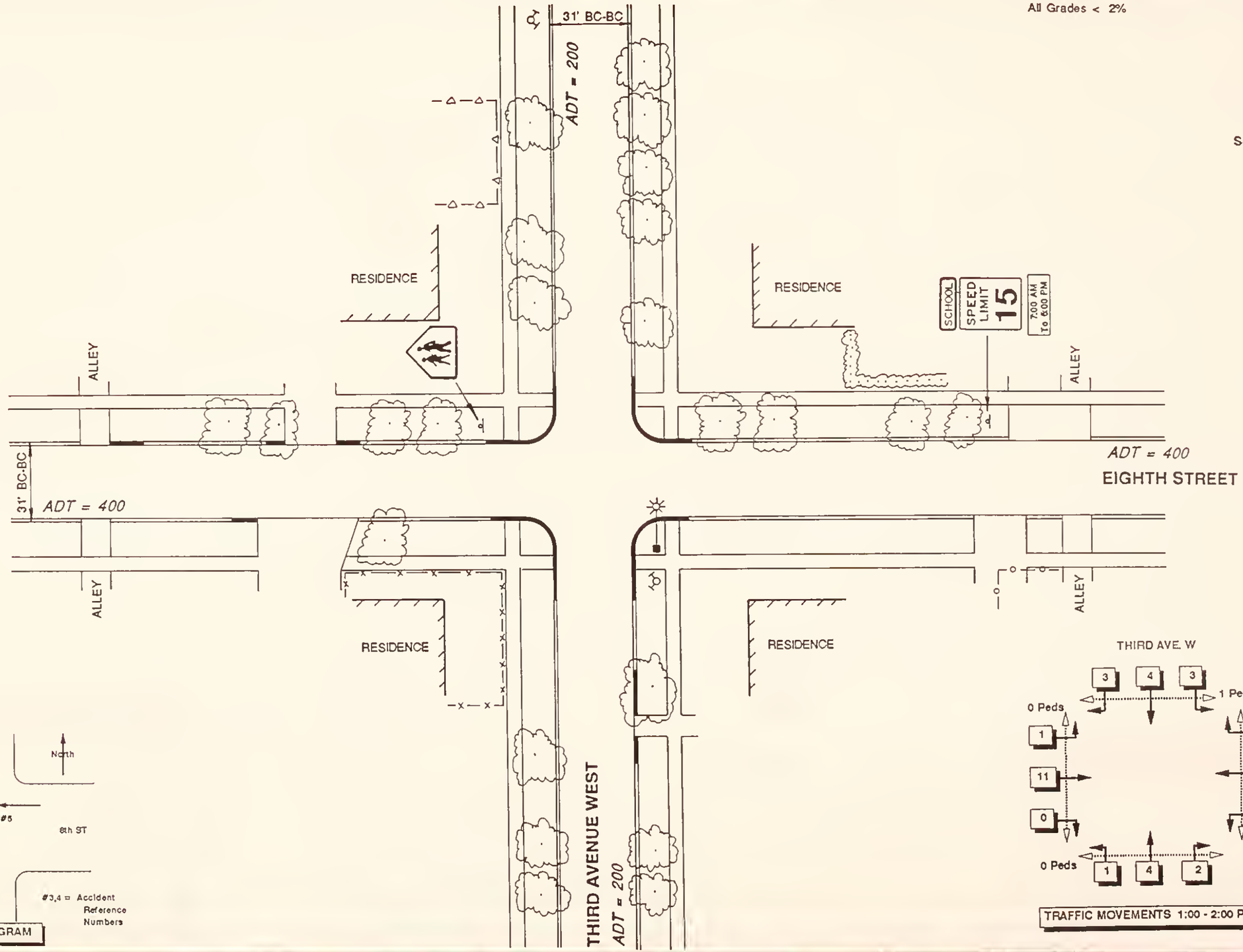
THIRD AVENUE WEST & THIRD STREET

SHORT TERM IMPROVEMENTS

SHEET 7

All Grades < 2%

SCALE: 1" = 40'



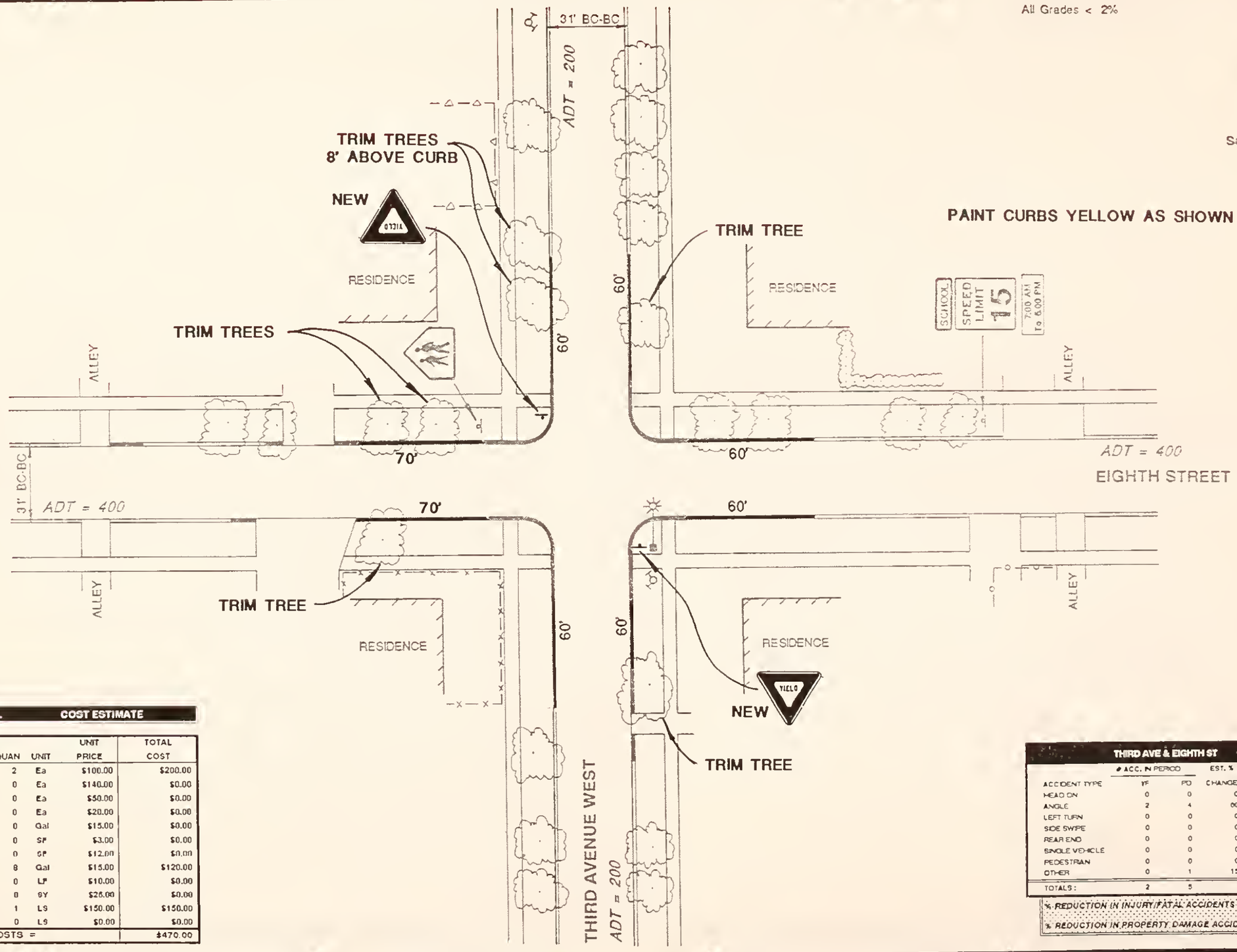
TRAFFIC MOVEMENTS 1:00 - 2:00 PM 9/30/92

MARVIN & ASSOCIATES Traffic, Transportation & Civil Engineers	1127 Alderson Ave. #204 Billings, MT 59102	THIRD AVENUE WEST & EIGHTH STREET	EXISTING CONDITIONS

SHEET 8

All Grades < 2%

SCALE: 1" = 40'



THIRD AVE. W & EIGHTH ST. COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (,6 SF)	2	Ea	$100.00	$200.00
2	NEW SIGNS (6.1 to 10 SF)	0	Ea	$140.00	$0.00
3	RELOCATE SIGNS	0	Ea	$50.00	$0.00
4	REMOVE SIGNS	0	Ea	$20.00	$0.00
5	PAVE. MARKINGS (PAINT)	0	Gal	$15.00	$0.00
6	PAVE. MARKING PLASTIC	0	SF	$3.00	$0.00
7	PLASTIC WORDS & SYMBOLS	0	SF	$12.00	$0.00
8	CURB PAINT - YELLOW	8	Gal	$15.00	$120.00
9	NEW CURB & GUTTER	0	LF	$10.00	$0.00
10	NEW SIDEWALK	0	SY	$26.00	$0.00
11	TRIM TREES	1	LS	$150.00	$150.00
12	MISCELLANEOUS	0	LS	$0.00	$0.00
	TOTAL CONSTRUCTION COSTS =				$470.00

THIRD AVE & EIGHTH ST

	# ACC. IN PERIOD		EST. %	CHANGE IN # ACC.	
ACCIDENT TYPE	I/F	PD	CHANGE	I/F	PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	2	4	00%	1.2	2.4
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	0	0%	0.0	0.0
REAR END	0	0	0%	0.0	0.0
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	1	15%	0.0	0.2
TOTALS:	2	5		1.2	2.6

% REDUCTION IN INJURY/FATAL ACCIDENTS = 60.0%

% REDUCTION IN PROPERTY DAMAGE ACCIDENTS = 51.0%

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

THIRD AVENUE WEST & EIGHTH STREET

SHORT TERM IMPROVEMENTS

SHEET 9

All Grades < 1%

Both Streets Have Parabolic X-Sections with High Crown

SCALE: 1" = 40'

31' BC-BC

ADT = 400

RESIDENCE

ALLEY

St. Name Signs

31' BC-BC

ADT = 800

ALLEY

RESIDENCE

RESIDENCE

ALLEY

ADT = 900

EIGHTH STREET

RESIDENCE

ALLEY

RESIDENCE

SECOND AVENUE WEST

ADT = 300

2nd AVE W

North

#9

#3,8

#1,2,6,7, 11,12

8th ST.

#4,5,10

#3,8 = Accident Reference Numbers

COLLISION DIAGRAM

SECOND AVE W

3 4 3 — 3 Peds

0 Peds — 1 — 6

34 — 7 — EIGHTH ST

1 — 1 — 0 Peds

1 Peds — 0 7 3

TRAFFIC MOVEMENTS 9:00 - 10:00 AM 10/1/92

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

SECOND AVENUE WEST & EIGHTH STREET

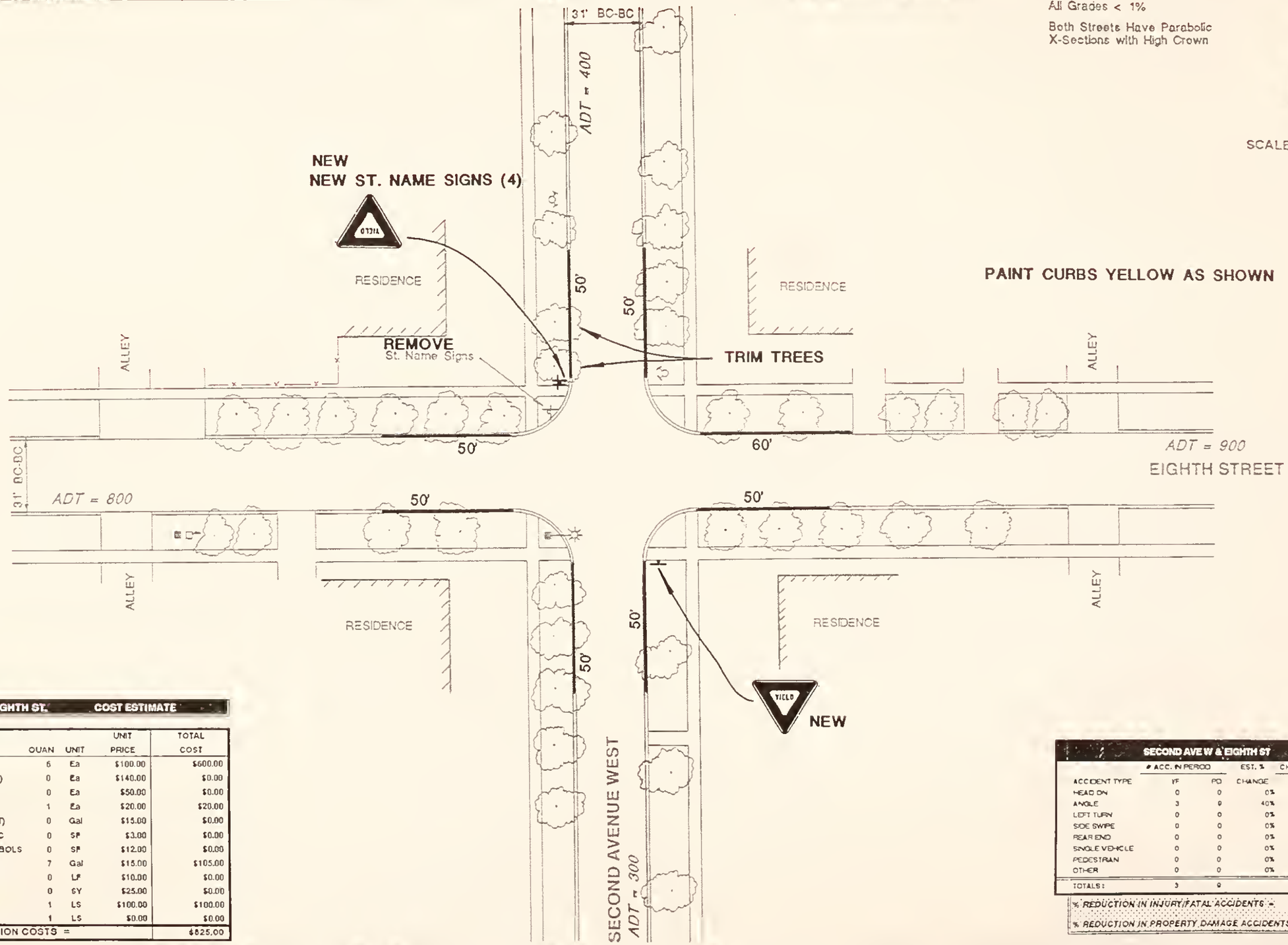
EXISTING CONDITIONS

SHEET 10

All Grades < 1%

Both Streets Have Parabolic X-Sections with High Crown

SCALE: 1" = 40'



SECOND AVE. W & EIGHTH ST. COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (,6 SF)	6	Ea	$100.00	$600.00
2	NEW SIGNS (6.1 to 10 SF)	0	Ea	$140.00	$0.00
3	RELOCATE SIGNS	0	Ea	$50.00	$0.00
4	REMOVE SIGNS	1	Ea	$20.00	$20.00
5	PAVE. MARKINGS (PAINT)	0	Gal	$15.00	$0.00
6	PAVE. MARKING PLASTIC	0	SF	$3.00	$0.00
7	PLASTIC WORDS & SYMBOLS	0	SF	$12.00	$0.00
8	CURB PAINT - YELLOW	7	Gal	$15.00	$105.00
9	NEW CURB & GUTTER	0	LF	$10.00	$0.00
10	NEW SIDEWALK	0	SY	$25.00	$0.00
11	TRIM TREES	1	LS	$100.00	$100.00
12	MISCELLANEOUS	1	LS	$0.00	$0.00
	TOTAL CONSTRUCTION COSTS =				$825.00

SECOND AVE W & EIGHTH ST

	# ACC. IN PERIOD		EST. % CHANGE	CHANGE IN # ACC.	
ACCIDENT TYPE	I/F	PD		I/F	PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	3	9	40%	1.2	3.6
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	0	0%	0.0	0.0
REAR END	0	0	0%	0.0	0.0
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	0	0%	0.0	0.0
TOTALS:	3	9		1.2	3.6
% REDUCTION IN INJURY/FATAL ACCIDENTS =				40.0%	
% REDUCTION IN PROPERTY DAMAGE ACCIDENTS =					40.0%

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers
1127 Alderson Ave. #204
Billings, MT 59102

SECOND AVENUE WEST & EIGHTH STREET

SHORT TERM IMPROVEMENTS

SHEET 11

All Grades < 1%

Both Streets Have Parabolic
X-section with Moderate Crown

SCALE: 1" = 40'

43' BC-BC

ADT = 6000

RESIDENCE

ALLEY

STOP

RESIDENCE

ALLEY

8'

ADT = 4000

ELEVENTH STREET

35' BC-BC

ADT = 3100

ALLEY

RESIDENCE

STOP

St. Name Signs

FIRST AVENUE WEST

ADT = 4600

8'

ALLEY

RESIDENCE

1st AVE W

North

#3,8,9, 12,17

#19

#2,11,16, 16,18

ELEVENTH

#1,4,5,6, 7,10,13, 14

#20

#3,4 = Accident Reference Numbers

COLLISION DIAGRAM

FIRST AVE. W

9 143 77

3 Peds

5 Peds

23

94

34

71

77 ELEVENTH ST

1

2 Peds

1 Peds

20 163 9

TRAFFIC MOVEMENTS 12:00 - 1:00 PM 9/30/92

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

FIRST AVENUE WEST & ELEVENTH STREET

EXISTING CONDITIONS

SHEET 12

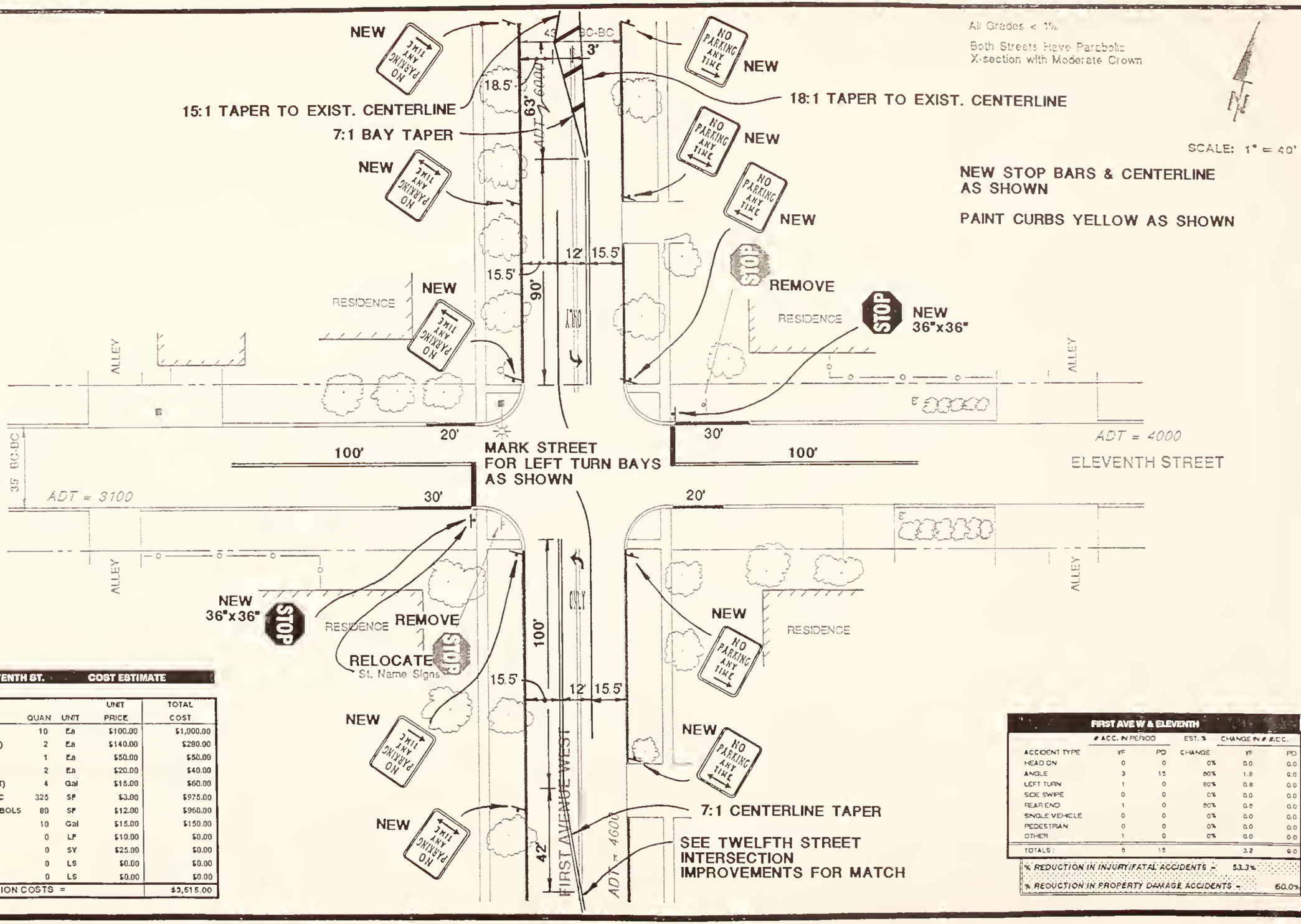
All Grades < 1%

Both Streets Have Parabolic X-section with Moderate Crown

SCALE: 1" = 40'

NEW STOP BARS & CENTERLINE AS SHOWN

PAINT CURBS YELLOW AS SHOWN



FIRST AVE. W & ELEVENTH ST. — COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (,6 SF)	10	Ea	$100.00	$1,000.00
2	NEW SIGNS (6.1 to 10 SF)	2	Ea	$140.00	$280.00
3	RELOCATE SIGNS	1	Ea	$50.00	$50.00
4	REMOVE SIGNS	2	Ea	$20.00	$40.00
5	PAVE. MARKINGS (PAINT)	4	Gal	$15.00	$60.00
6	PAVE. MARKING PLASTIC	325	SF	$3.00	$975.00
7	PLASTIC WORDS & SYMBOLS	80	SF	$12.00	$960.00
8	CURB PAINT - YELLOW	10	Gal	$15.00	$150.00
9	NEW CURB & GUTTER	0	LF	$10.00	$0.00
10	NEW SIDEWALK	0	SY	$25.00	$0.00
11	TRIM TREES	0	LS	$0.00	$0.00
12	MISCELLANEOUS	0	LS	$0.00	$0.00
	TOTAL CONSTRUCTION COSTS =				$3,515.00

FIRST AVE W & ELEVENTH

ACCIDENT TYPE	# ACC. IN PERIOD WF	PD	EST. % CHANGE	CHANGE IN # ACC. WF	PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	3	15	60%	1.8	0.0
LEFT TURN	1	0	80%	0.8	0.0
SIDE SWIPE	0	0	0%	0.0	0.0
REAR END	1	0	80%	0.8	0.0
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	1	0	0%	0.0	0.0
TOTALS :	6	15		3.2	9.0
% REDUCTION IN INJURY/FATAL ACCIDENTS =				53.3%	
% REDUCTION IN PROPERTY DAMAGE ACCIDENTS =					60.0%

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers
1127 Alderson Ave. #204
Billings, MT 59102

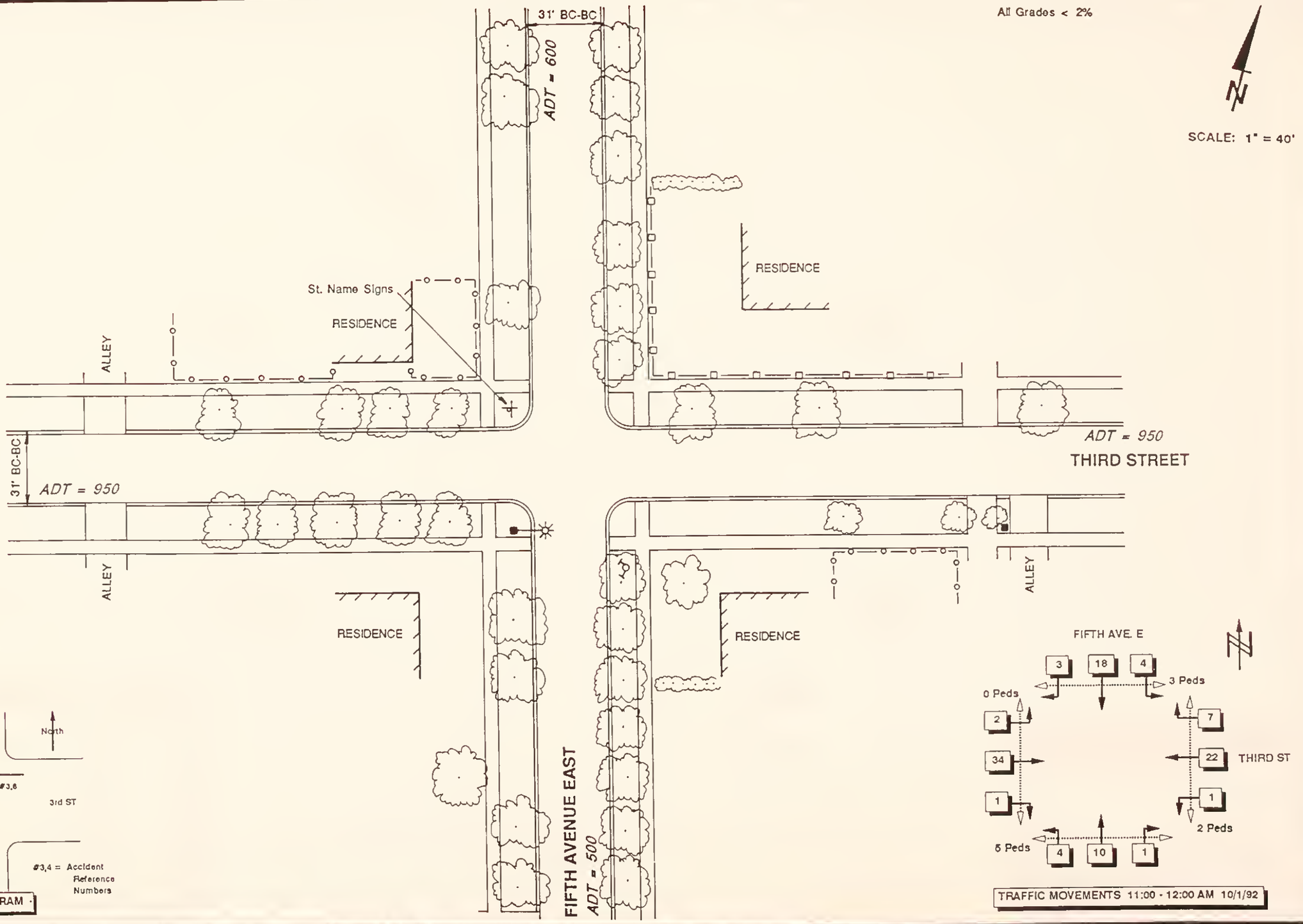
FIRST AVENUE WEST & ELEVENTH STREET

SHORT TERM IMPROVEMENTS

SHEET 13

All Grades < 2%

SCALE: 1" = 40'



MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

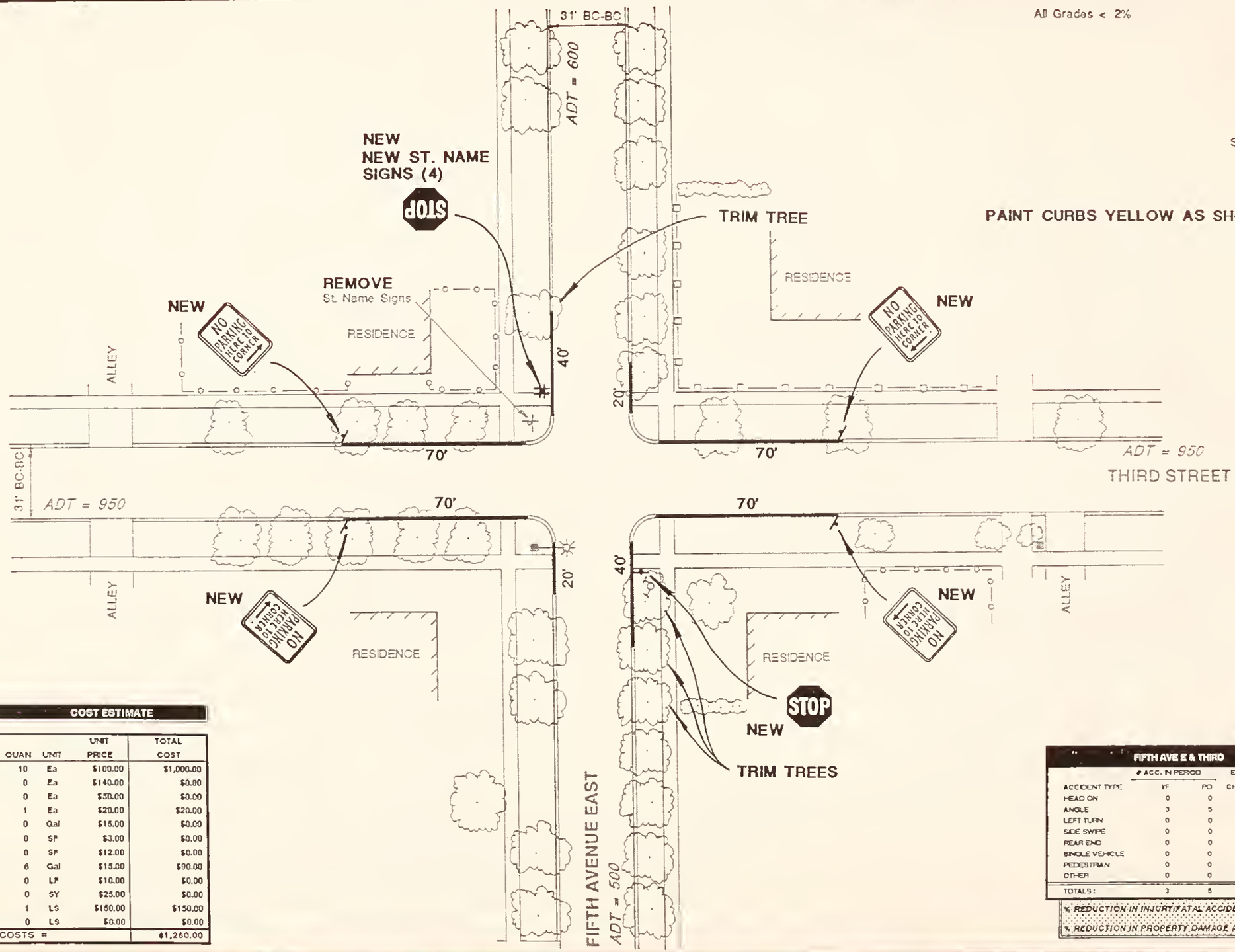
FIFTH AVENUE EAST & THIRD STREET

EXISTING CONDITIONS

SHEET 14

All Grades < 2%

SCALE: 1" = 40'



FIFTH AVE. E & THIRD ST. — COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (.6 SF)	10	Ea	$100.00	$1,000.00
2	NEW SIGNS (6.1 to 10 SF)	0	Ea	$140.00	$0.00
3	RELOCATE SIGNS	0	Ea	$50.00	$0.00
4	REMOVE SIGNS	1	Ea	$20.00	$20.00
5	PAVE. MARKINGS (PAINT)	0	Gal	$15.00	$0.00
6	PAVE. MARKING PLASTIC	0	SF	$3.00	$0.00
7	PLASTIC WORDS & SYMBOLS	0	SF	$12.00	$0.00
8	CURB PAINT - YELLOW	6	Gal	$15.00	$90.00
9	NEW CURB & GUTTER	0	LF	$10.00	$0.00
10	NEW SIDEWALK	0	SY	$25.00	$0.00
11	TRIM TREES	1	LS	$150.00	$150.00
12	MISCELLANEOUS	0	LS	$0.00	$0.00
	TOTAL CONSTRUCTION COSTS =				$1,260.00

FIFTH AVE E & THIRD

ACCIDENT TYPE	# ACC. IN PERIOD IF	# ACC. IN PERIOD PD	EST. % CHANGE	CHANGE IN # ACC. IF	CHANGE IN # ACC. PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	3	5	70%	2.1	3.5
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	0	0%	0.0	0.0
REAR END	0	0	0%	0.0	0.0
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	0	0%	0.0	0.0
TOTALS:	3	5		2.1	3.5

% REDUCTION IN INJURY/FATAL ACCIDENTS = 70.0%

% REDUCTION IN PROPERTY DAMAGE ACCIDENTS = 70.0%

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers
1127 Alderson Ave. #204
Billings, MT 59102

FIFTH AVENUE EAST & THIRD STREET

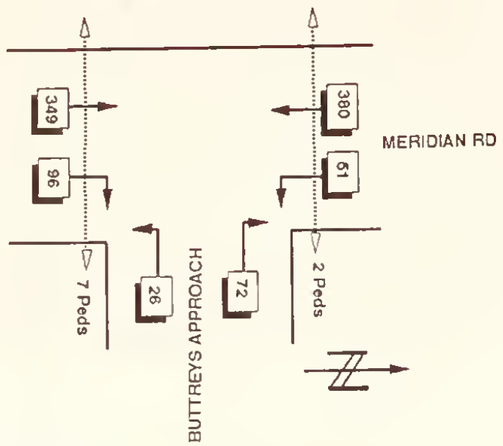
SHORT TERM IMPROVEMENTS

SHEET 15

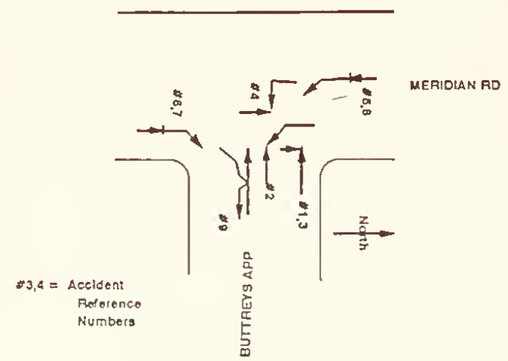
All Grades < 2%

N

SCALE: 1" = 40'



TRAFFIC MOVEMENTS 4:00 - 5:00 PM 9/30/92



COLLISION DIAGRAM

CAR LOT

Ad Sign

HWY 2 WEST (IDAHO ST)

MERIDIAN ROAD

BC-BC

35'

ADT = 10300

ADT = 10000

BC-BC

47'

4%

Parking Lot

Enter

Enter

Enter

Enter

Parking Lot

Traffic Controller

ONLY

BUTTREY'S ACCESS

ADT = 3000

BUTTREYS STORE

MARVIN & ASSOCIATES Traffic, Transportation & Civil Engineers	1127 Alderson Ave. #204 Billings, MT 59102	MERIDIAN ROAD & BUTTREY'S ACCESS	EXISTING CONDITIONS

SHEET 16

All Grades < 2%

N

SCALE: 1" = 40'

MERIDIAN & BUTTREYS' APP. COST ESTIMATE

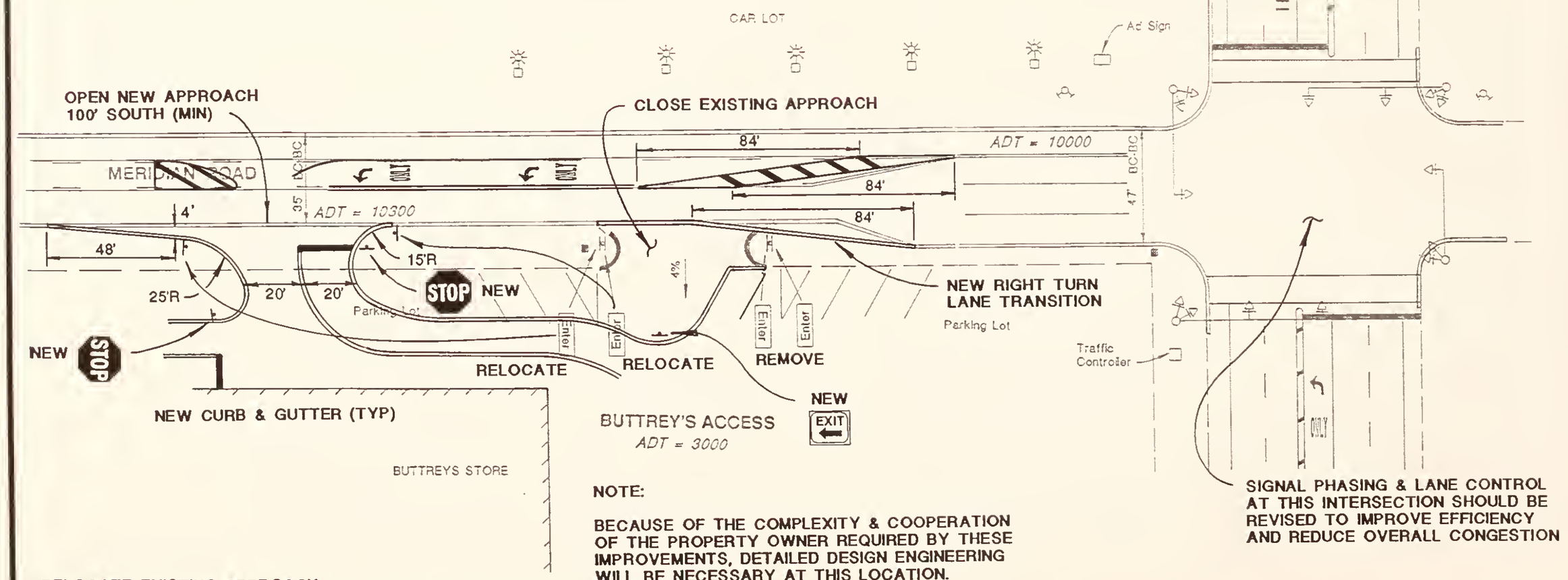
ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (,6 SF)	3	Ea	$100.00	$300.00
2	NEW SIGNS (6.1 to 10 SF)	0	Ea	$140.00	$0.00
3	RELOCATE SIGNS	2	Ea	$50.00	$100.00
4	REMOVE SIGNS	2	Ea	$20.00	$40.00
5	PAVE. MARKINGS (PAINT)	6	Gal	$15.00	$90.00
6	PAVE. MARKING PLASTIC	400	SF	$3.00	$1,200.00
7	PLASTIC WORDS & SYMBOLS	80	SF	$12.00	$960.00
8	CURB PAINT - YELLOW	8	Gal	$15.00	$120.00
9	NEW CURB & GUTTER	480	LF	$10.00	$4,800.00
10	LANDSCAPING & DRAINAGE	1	LS	$5,000.00	$5,000.00
11	TRIM TREES	1	LS	$0.00	$0.00
12	MISC. & CONTINGENCY	1	LS	$1,500.00	$1,500.00
	TOTAL CONSTRUCTION COSTS =				$14,110.00

MERIDIAN & BUTTREYS' APP

ACCIDENT TYPE	# ACC. IN PERIOD IF	# ACC. IN PERIOD PD	EST. % CHANGE	CHANGE IN # ACC. IF	CHANGE IN # ACC. PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	0	3	60%	0.0	1.8
LEFT TURN	1	0	80%	0.8	0.0
SIDE SWIPE	0	1	60%	0.0	0.5
REAR END	0	4	80%	0.0	3.2
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	0	0%	0.0	0.0
TOTALS:	1	8		0.8	5.5

% REDUCTION IN INJURY/FATAL ACCIDENTS = 80.0%

% REDUCTION IN PROPERTY DAMAGE ACCIDENTS = 68.8%



NOTE:

BECAUSE OF THE COMPLEXITY & COOPERATION OF THE PROPERTY OWNER REQUIRED BY THESE IMPROVEMENTS, DETAILED DESIGN ENGINEERING WILL BE NECESSARY AT THIS LOCATION.

SIGNAL PHASING & LANE CONTROL AT THIS INTERSECTION SHOULD BE REVISED TO IMPROVE EFFICIENCY AND REDUCE OVERALL CONGESTION

RELOCATE EXISTING APPROACH
OBLITERATE EXISTING & NEW PAVEMENT MARKS AS SHOWN

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers
1127 Alderson Ave. #204
Billings, MT 59102

MERIDIAN ROAD & BUTTREY'S ACCESS

SHORT TERM IMPROVEMENTS

SHEET 17

All Grades < 1%

SCALE: 1" = 40'

42' BC-BC

ADT = 1500

Parking Lot

BUSINESS

Gas Pump Islands

Parking Lot

ALLEY

Parking Lot

ALLEY

ADT = 2000

MONTANA STREET

42' BC-BC

ADT = 1900

Gate

BUSINESS

ALLEY

Lay Down Curb

BUSINESS

Gate

St. Name Signs

BUSINESS

Car Lot

ALLEY

FIRST AVENUE WEST

ADT = 800

1st AVE W

North

#9

#5

#1,4

MONTANA

#2,6,10

#8

#3,5,7

#3,4 = Accident Reference Numbers

COLLISION DIAGRAM

FIRST AVE. W.

16 39 20

3 Peds

4 Peds

20

29

75

59

MONTANA ST

6

7

7 Peds

0 Peds

7 20 1

TRAFFIC MOVEMENTS 3:00 - 4:00 PM 9/29/92

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

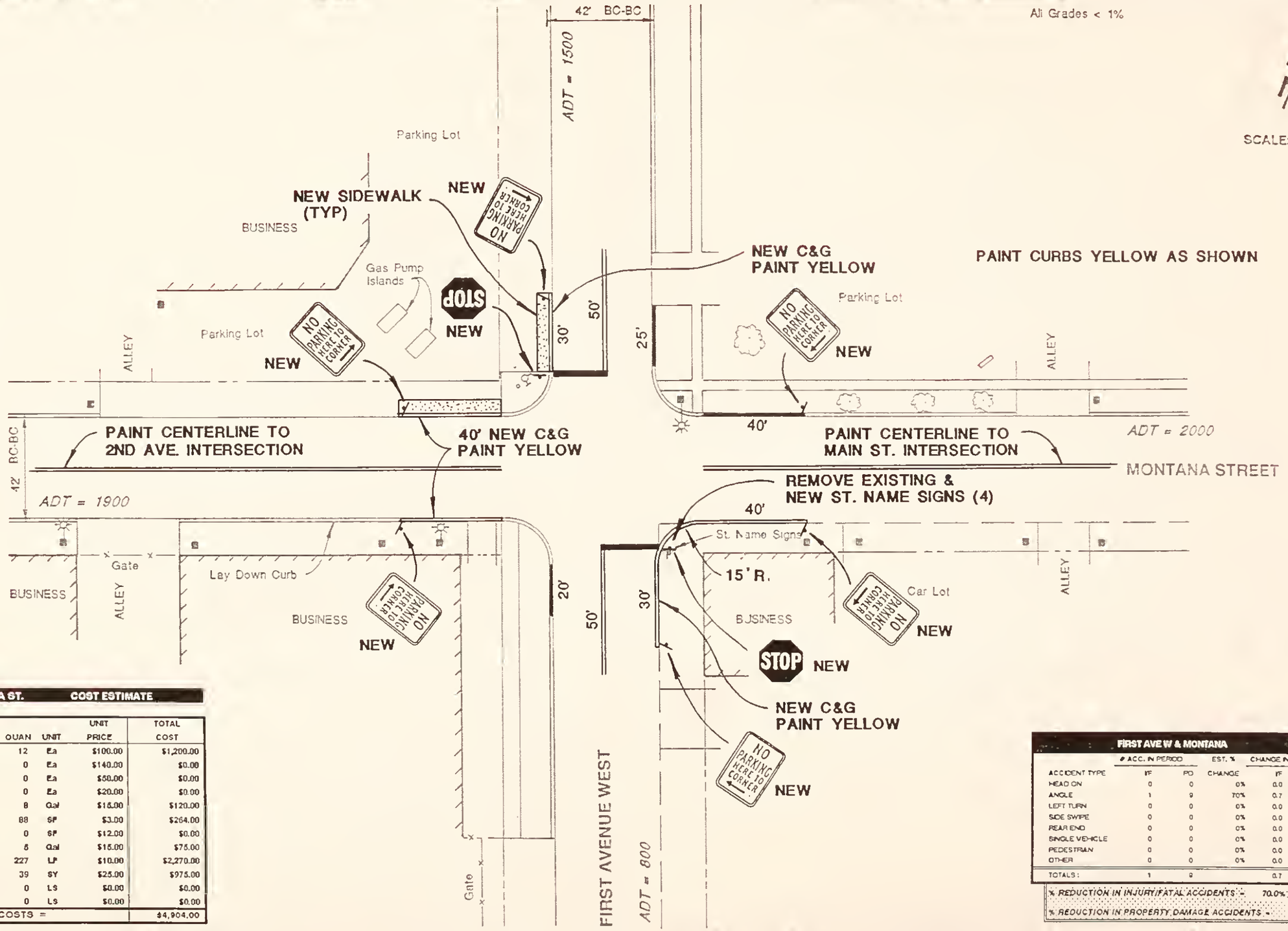
FIRST AVENUE WEST & MONTANA STREET

EXISTING CONDITIONS

SHEET 18

All Grades < 1%

SCALE: 1" = 40'



FIRST AVE. W & MONTANA ST. COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (,6 SF)	12	Ea	$100.00	$1,200.00
2	NEW SIGNS (6.1 to 10 SF)	0	Ea	$140.00	$0.00
3	RELOCATE SIGNS	0	Ea	$50.00	$0.00
4	REMOVE SIGNS	0	Ea	$20.00	$0.00
5	PAVE. MARKINGS (PAINT)	8	Gal	$15.00	$120.00
6	PAVE. MARKING PLASTIC	88	SF	$3.00	$264.00
7	PLASTIC WORDS & SYMBOLS	0	SF	$12.00	$0.00
8	CURB PAINT - YELLOW	5	Gal	$15.00	$75.00
9	NEW CURB & GUTTER	227	LF	$10.00	$2,270.00
10	NEW SIDEWALK	39	SY	$25.00	$975.00
11	TRIM TREES	0	LS	$0.00	$0.00
12	MISCELLANEOUS	0	LS	$0.00	$0.00
	TOTAL CONSTRUCTION COSTS =				$4,904.00

FIRST AVE W & MONTANA

ACCIDENT TYPE	# ACC. IN PERIOD IF	# ACC. IN PERIOD PD	EST. % CHANGE	CHANGE IN # ACC. IF	CHANGE IN # ACC. PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	1	9	70%	0.7	6.3
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	0	0%	0.0	0.0
REAR END	0	0	0%	0.0	0.0
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	0	0%	0.0	0.0
TOTALS:	1	9		0.7	6.3

% REDUCTION IN INJURY/FATAL ACCIDENTS = 70.0%

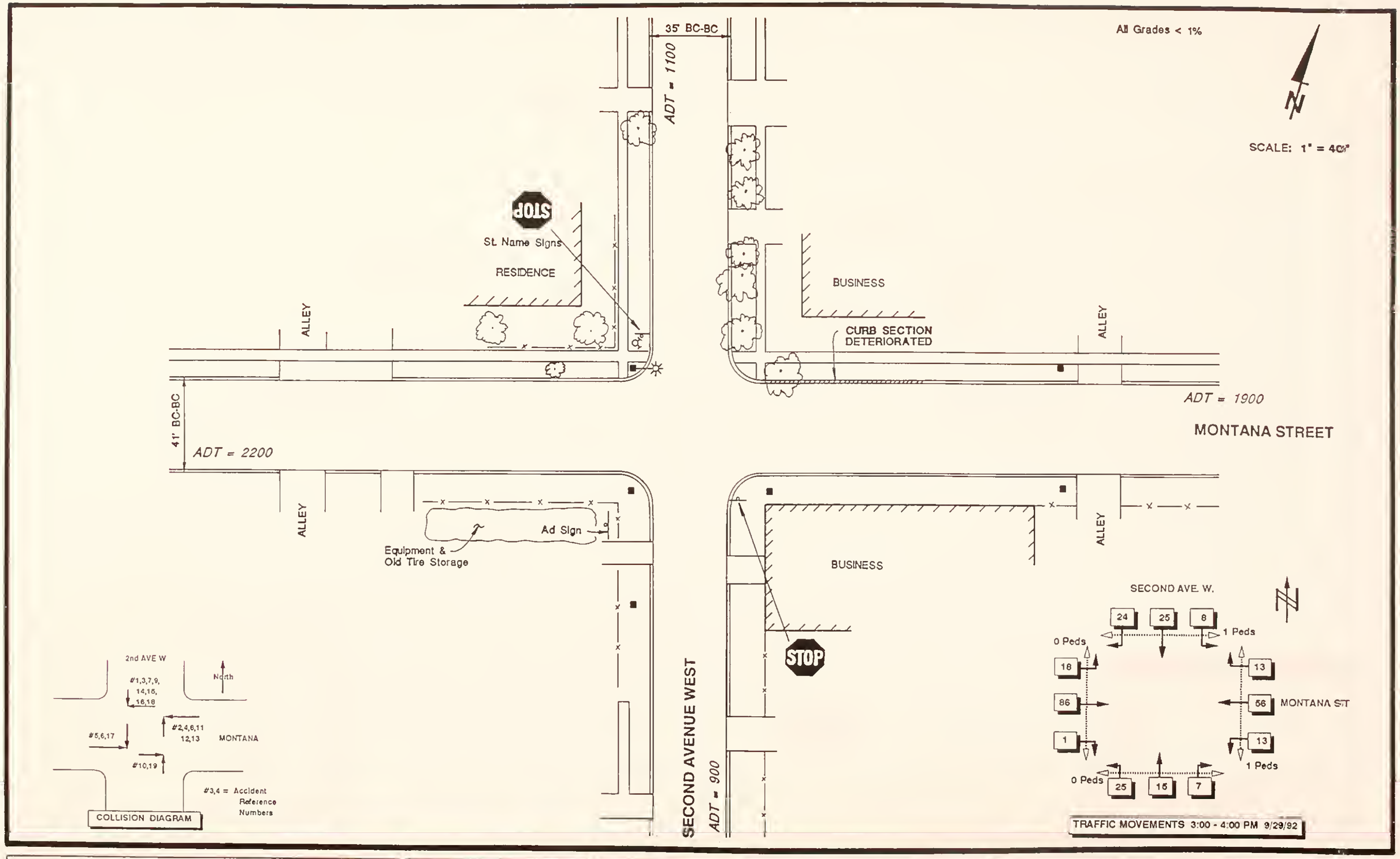
% REDUCTION IN PROPERTY DAMAGE ACCIDENTS = 70.0%

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers
1127 Alderson Ave. #204
Billings, MT 59102

FIRST AVENUE WEST & MONTANA STREET

SHORT TERM IMPROVEMENTS

SHEET 19



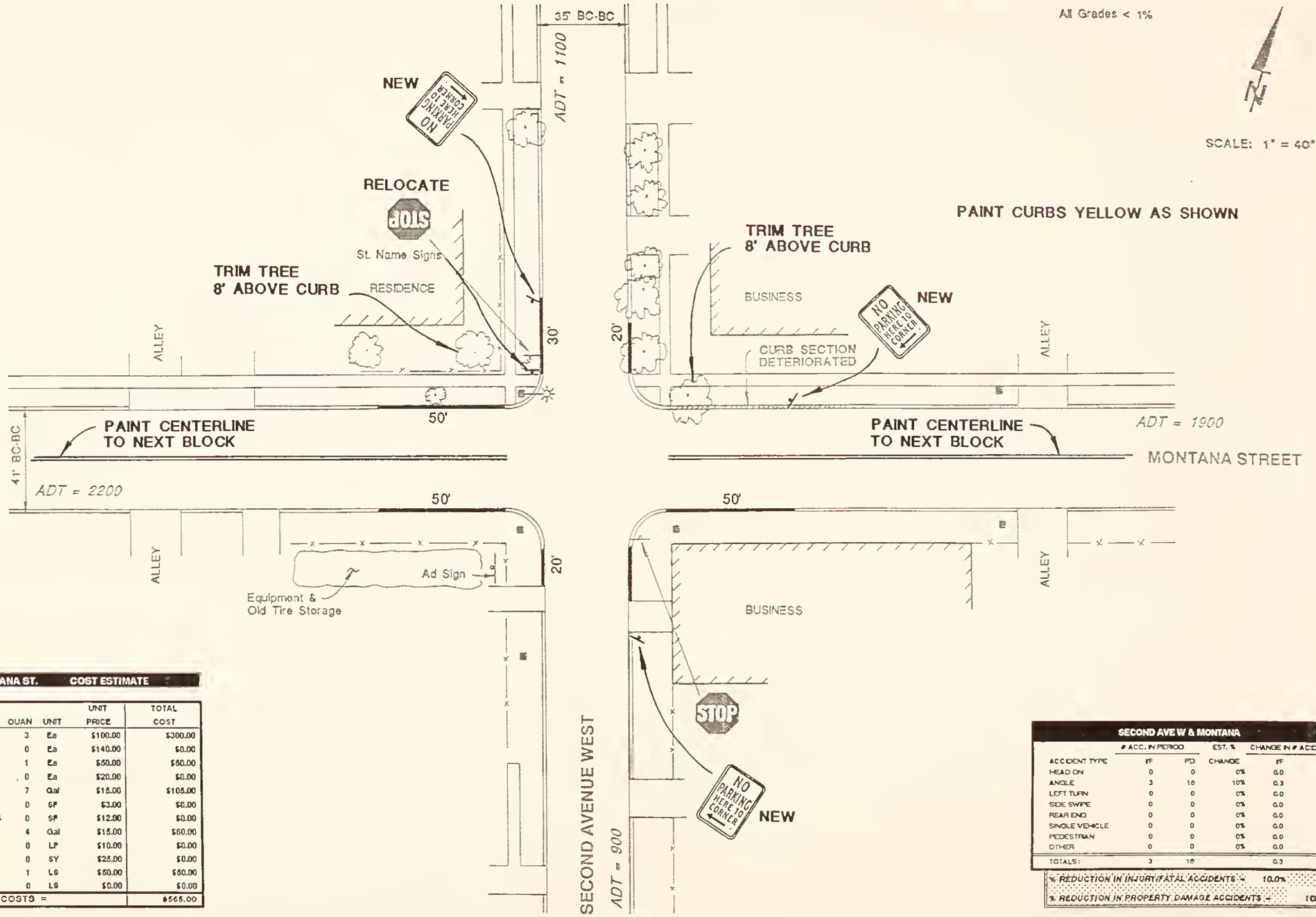
MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

SECOND AVENUE WEST & MONTANA STREET

EXISTING CONDITIONS

SHEET 2.0



SECOND AVE. W & MONTANA ST. COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (,6 SF)	3	Ea	$100.00	$300.00
2	NEW SIGNS (6.1 to 10 SF)	0	Ea	$140.00	$0.00
3	RELOCATE SIGNS	1	Ea	$50.00	$50.00
4	REMOVE SIGNS	0	Ea	$20.00	$0.00
6	PAVE. MARKINGS (PAINT)	7	Gal	$15.00	$105.00
6	PAVE. MARKING PLASTIC	0	SF	$3.00	$0.00
7	PLASTIC WORDS & SYMBOLS	0	SF	$12.00	$0.00
8	CURB PAINT - YELLOW	4	Gal	$15.00	$60.00
9	NEW CURB & GUTTER	0	LF	$10.00	$0.00
10	NEW SIDEWALK	0	SY	$25.00	$0.00
11	TRIM TREES	1	LS	$50.00	$50.00
12	MISCELLANEOUS	0	LS	$0.00	$0.00
	TOTAL CONSTRUCTION COSTS =				$565.00

SECOND AVE W & MONTANA

	# ACC. IN PERIOD		EST. %	CHANGE IN # ACC.	
ACCIDENT TYPE	IF	PD	CHANGE	IF	PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	3	16	10%	0.3	1.6
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	0	0%	0.0	0.0
REAR END	0	0	0%	0.0	0.0
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	0	0%	0.0	0.0
TOTALS:	3	16		0.3	1.6

% REDUCTION IN INJURY/FATAL ACCIDENTS = 10.0%

% REDUCTION IN PROPERTY DAMAGE ACCIDENTS = 10.0%

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers
1127 Alderson Ave. #204
Billings, MT 59102

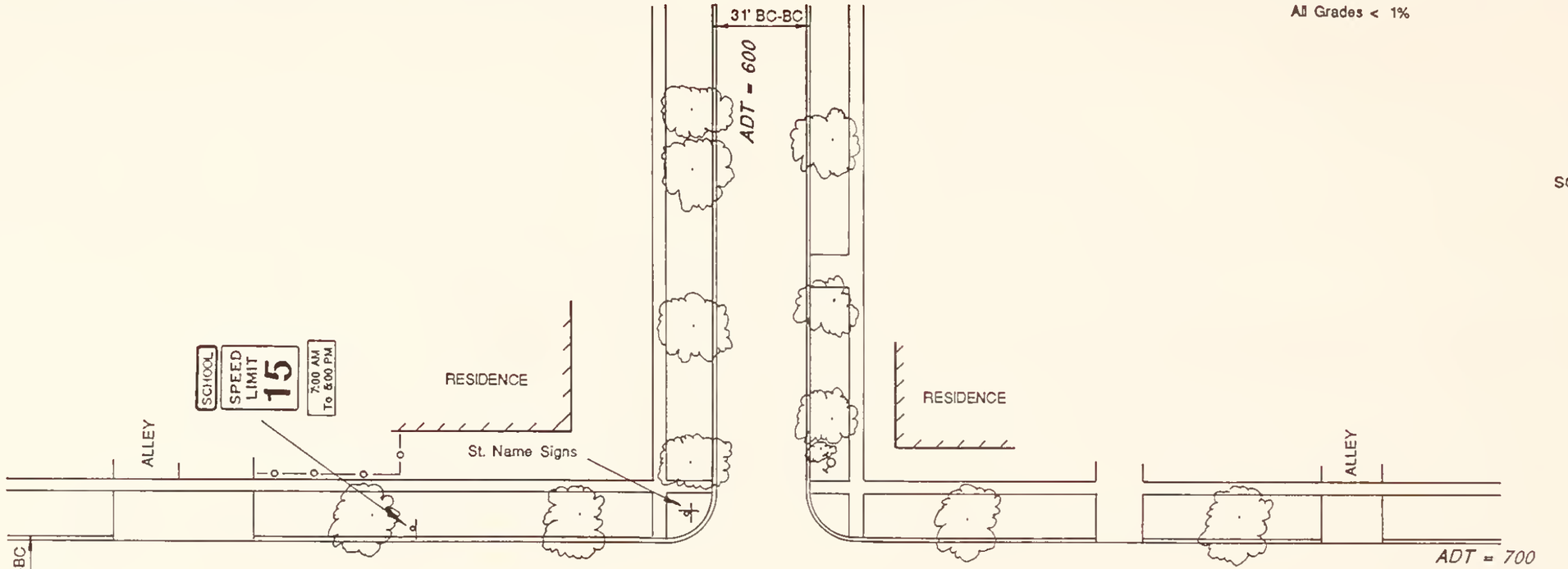
SECOND AVENUE WEST & MONTANA STREET

SHORT TERM IMPROVEMENTS

SHEET 21

All Grades < 1%

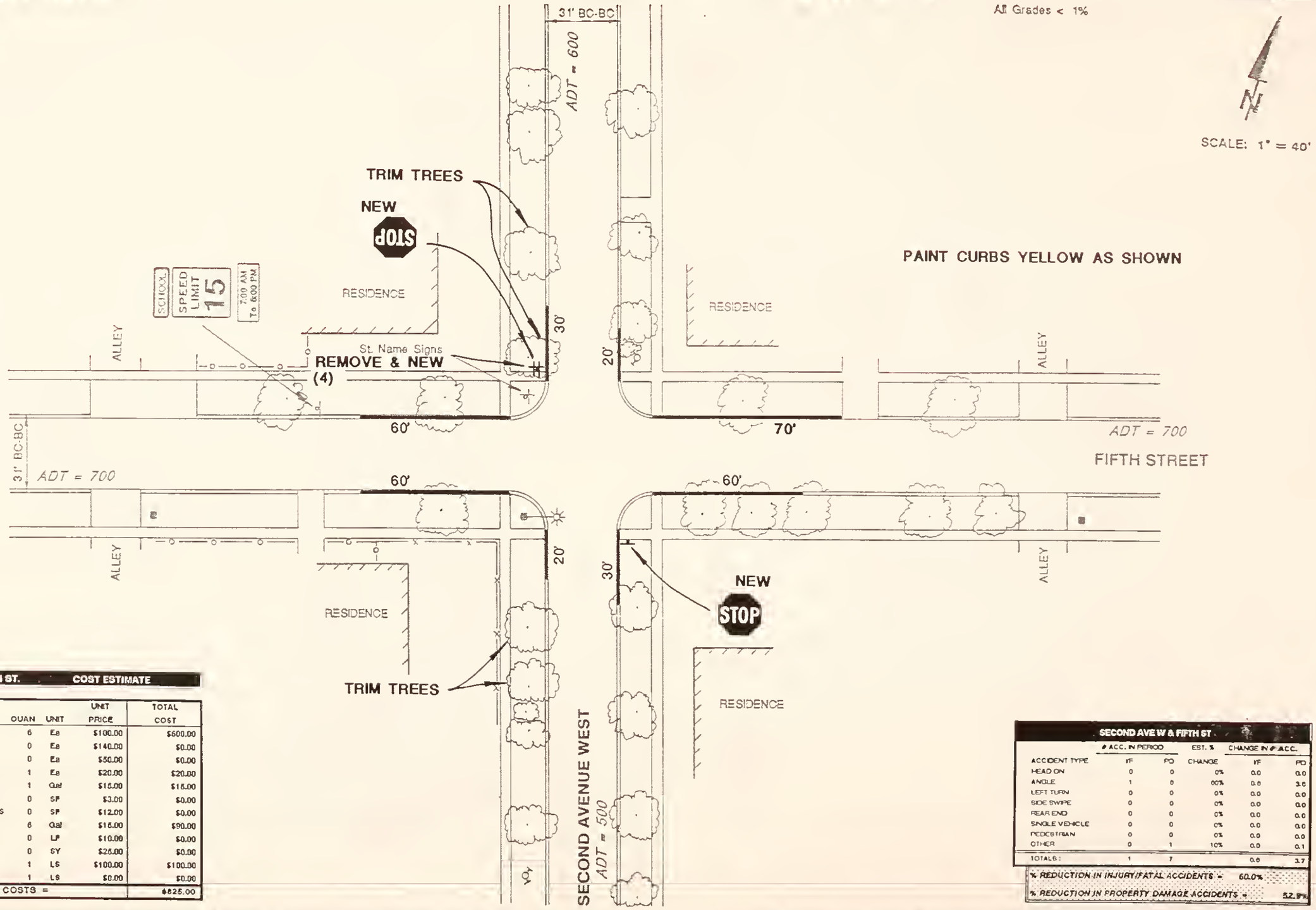
SCALE: 1" = 40'



TRAFFIC MOVEMENTS 2:00 - 3:00 PM 9/30/92

MARVIN & ASSOCIATES Traffic, Transportation & Civil Engineers	1127 Alderson Ave. #204 Billings, MT 59102	SECOND AVENUE WEST & FIFTH STREET	EXISTING CONDITIONS

SHEET 22



SECOND AVE. W & FIFTH ST. — COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (.6 SF)	6	Ea	$100.00	$600.00
2	NEW SIGNS (6.1 to 10 SF)	0	Ea	$140.00	$0.00
3	RELOCATE SIGNS	0	Ea	$50.00	$0.00
4	REMOVE SIGNS	1	Ea	$20.00	$20.00
5	PAVE. MARKINGS (PAINT)	1	Gal	$15.00	$15.00
6	PAVE. MARKING PLASTIC	0	SF	$3.00	$0.00
7	PLASTIC WORDS & SYMBOLS	0	SF	$12.00	$0.00
8	CURB PAINT - YELLOW	6	Gal	$15.00	$90.00
9	NEW CURB & GUTTER	0	LF	$10.00	$0.00
10	NEW SIDEWALK	0	SY	$25.00	$0.00
11	TRIM TREES	1	LS	$100.00	$100.00
12	MISCELLANEOUS	1	LS	$0.00	$0.00
	TOTAL CONSTRUCTION COSTS =				$825.00

SECOND AVE W & FIFTH ST

ACCIDENT TYPE	# ACC. IN PERIOD IF	PD	EST. % CHANGE	CHANGE IN # ACC. IF	PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	1	6	60%	0.6	3.6
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	0	0%	0.0	0.0
REAR END	0	0	0%	0.0	0.0
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	1	10%	0.0	0.1
TOTALS:	1	7		0.6	3.7
% REDUCTION IN INJURY/FATAL ACCIDENTS =			60.0%		
% REDUCTION IN PROPERTY DAMAGE ACCIDENTS =			52.9%		

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers
1127 Alderson Ave. #204
Billings, MT 59102

SECOND AVENUE WEST & FIFTH STREET

SHORT TERM IMPROVEMENTS

SHEET 23

All Gardes < 1%

Both Streets Have Parabolic X-section with High Crown

SCALE: 1" = 40'

51' BC-BC

ADT = 2500

Parking Lot

STOP

St. Name Signs

BUSINESS

ALLEY

Parking Lot

BUSINESS

Parking Lot

PRIVATE PARKING

NO PARKING

PRIVATE PARKING

ALLEY

ADT = 1600

FIRST STREET

BC-BC

51'

ADT = 1000

ALLEY

RESIDENCE

BUS STOP

SECOND AVENUE WEST

ADT = 2600

STOP

Parking Lot

BUSINESS

ALLEY

2nd AVE W

North

#2,8

1st ST.

#5

#1,3,4 6,7

#9

#3,4 = Accident Reference Numbers

COLLISION DIAGRAM

SECOND AVE. W

3 45 12

5 Peds

8 Peds

2

36

8

12

19 FIRST ST

11

2 Peds

11 Peds

3 98 18

TRAFFIC MOVEMENTS 10:00 - 11:00 AM 10/1/92

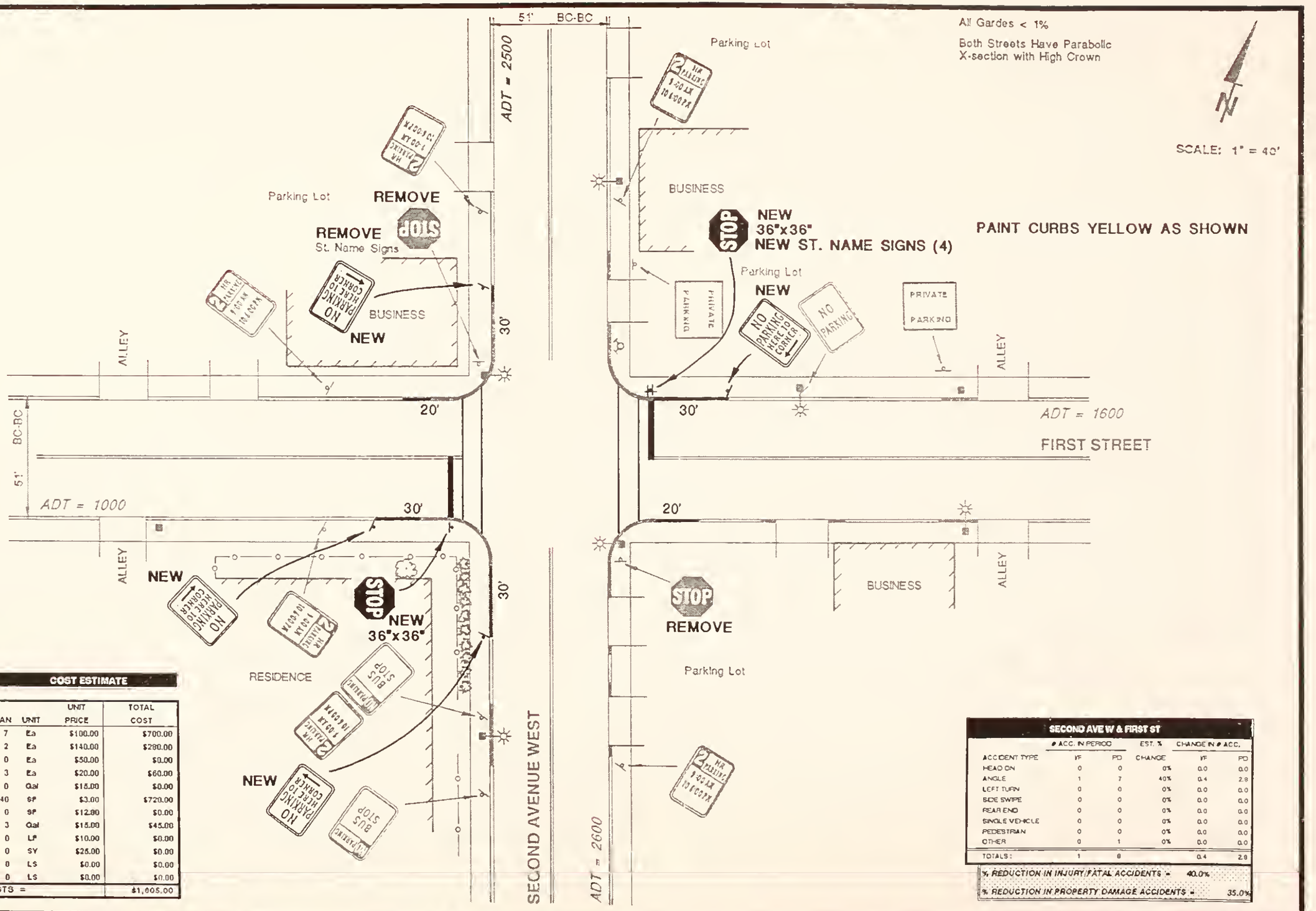
MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

SECOND AVENUE WEST & FIRST STREET

EXISTING CONDITIONS

SHEET 24



SECOND AVE. W & FIRST ST. COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (,6 SF)	7	Ea	$100.00	$700.00
2	NEW SIGNS (6.1 to 10 SF)	2	Ea	$140.00	$280.00
3	RELOCATE SIGNS	0	Ea	$50.00	$0.00
4	REMOVE SIGNS	3	Ea	$20.00	$60.00
5	PAVE. MARKINGS (PAINT)	0	Gal	$15.00	$0.00
6	PAVE. MARKING PLASTIC	240	SF	$3.00	$720.00
7	PLASTIC WORDS & SYMBOLS	0	SF	$12.00	$0.00
8	CURB PAINT - YELLOW	3	Gal	$15.00	$45.00
9	NEW CURB & GUTTER	0	LF	$10.00	$0.00
10	NEW SIDEWALK	0	SY	$25.00	$0.00
11	TRIM TREES	0	LS	$0.00	$0.00
12	MISCELLANEOUS	0	LS	$0.00	$0.00
	TOTAL CONSTRUCTION COSTS =				$1,005.00

SECOND AVE W & FIRST ST

	# ACC. IN PERIOD		EST. %	CHANGE IN # ACC.	
ACCIDENT TYPE	I/F	P/D	CHANGE	I/F	P/D
HEAD ON	0	0	0%	0.0	0.0
ANGLE	1	7	40%	0.4	2.8
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	0	0%	0.0	0.0
REAR END	0	0	0%	0.0	0.0
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	1	0%	0.0	0.0
TOTALS:	1	8		0.4	2.8

% REDUCTION IN INJURY/FATAL ACCIDENTS = 40.0%

% REDUCTION IN PROPERTY DAMAGE ACCIDENTS = 35.0%

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers
1127 Alderson Ave. #204
Billings, MT 59102

SECOND AVENUE WEST & FIRST STREET

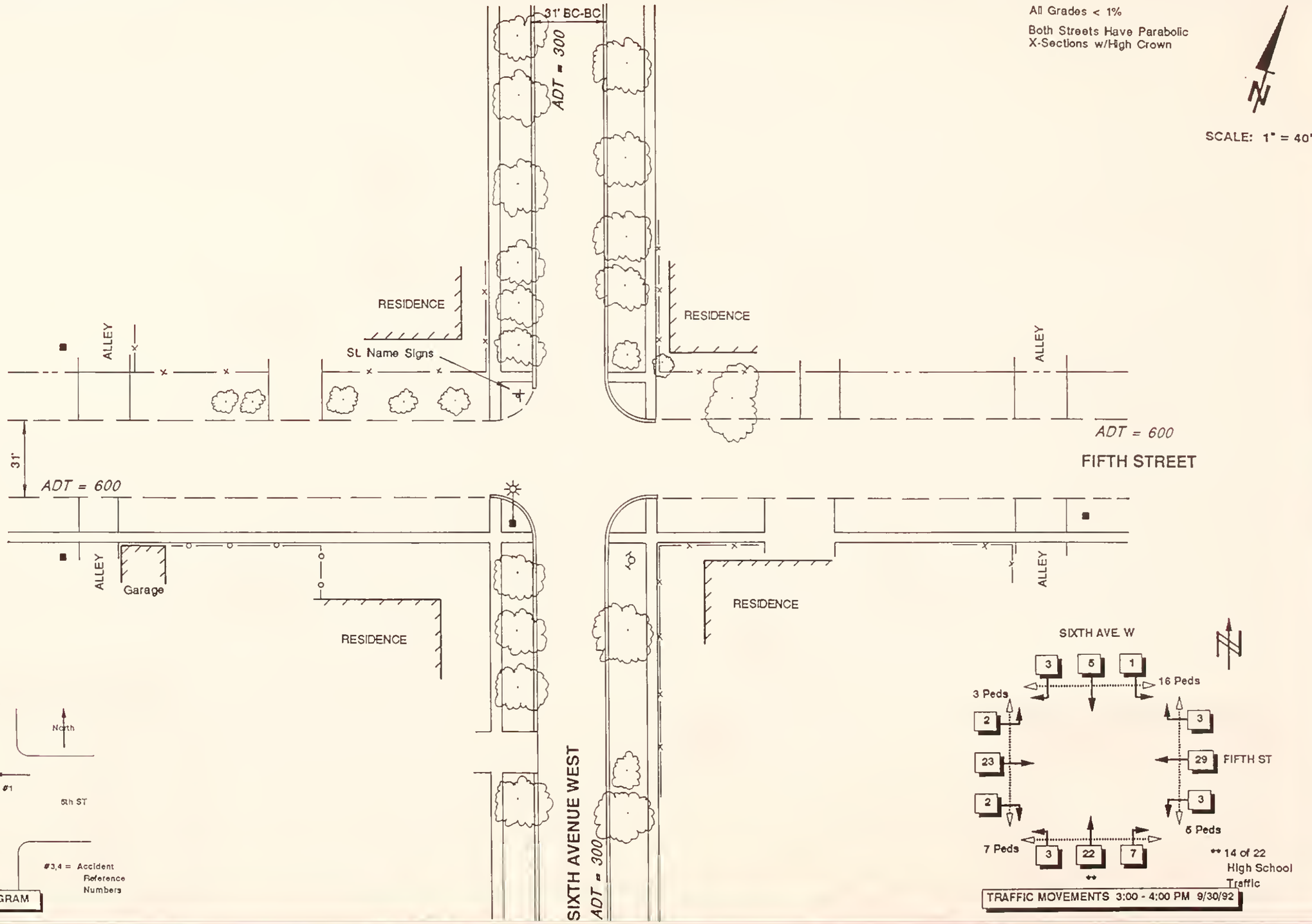
SHORT TERM IMPROVEMENTS

SHEET 25

All Grades < 1%

Both Streets Have Parabolic X-Sections w/High Crown

SCALE: 1" = 40'



MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

SIXTH AVENUE WEST & FIFTH STREET

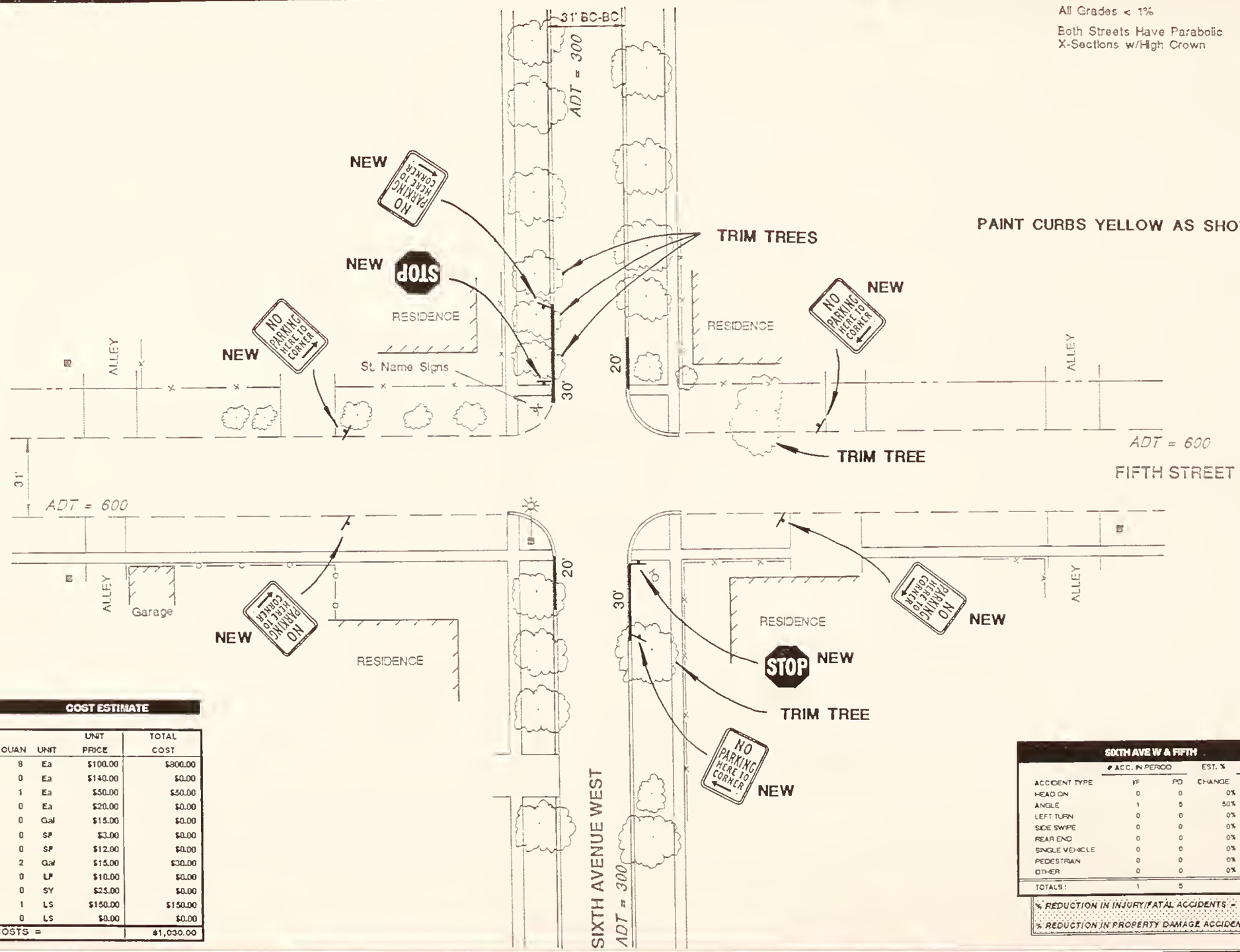
EXISTING CONDITIONS

SHEET 26

All Grades < 1%

Both Streets Have Parabolic X-Sections w/High Crown

SCALE: 1" = 40'



SIXTH AVE. & FIFTH ST. — COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (,6 SF)	8	Ea	$100.00	$800.00
2	NEW SIGNS (6.1 to 10 SF)	0	Ea	$140.00	$0.00
3	RELOCATE SIGNS	1	Ea	$50.00	$50.00
4	REMOVE SIGNS	0	Ea	$20.00	$0.00
5	PAVE. MARKINGS (PAINT)	0	Gal	$15.00	$0.00
6	PAVE. MARKING PLASTIC	0	SF	$3.00	$0.00
7	PLASTIC WORDS & SYMBOLS	0	SF	$12.00	$0.00
8	CURB PAINT - YELLOW	2	Gal	$15.00	$30.00
9	NEW CURB & GUTTER	0	LF	$10.00	$0.00
10	NEW SIDEWALK	0	SY	$25.00	$0.00
11	TRIM TREES	1	LS	$150.00	$150.00
12	MISCELLANEOUS	0	LS	$0.00	$0.00
	TOTAL CONSTRUCTION COSTS =				$1,030.00

SIXTH AVE W & FIFTH

ACCIDENT TYPE	# ACC. IN PERIOD F/F	# ACC. IN PERIOD P/D	EST. % CHANGE	CHANGE IN # ACC. F/F	CHANGE IN # ACC. P/D
HEAD ON	0	0	0%	0.0	0.0
ANGLE	1	5	50%	0.5	2.5
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	0	0%	0.0	0.0
REAR END	0	0	0%	0.0	0.0
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	0	0%	0.0	0.0
TOTALS:	1	5		0.5	2.5

% REDUCTION IN INJURY/FATAL ACCIDENTS = 50.0%

% REDUCTION IN PROPERTY DAMAGE ACCIDENTS = 50.0%

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

SIXTH AVENUE WEST & FIFTH STREET

SHORT TERM IMPROVEMENTS

SHEET 27

All Gardes < 2%

SCALE: 1" = 40'

31' BC-BC

ADT = 450

NO PARKING LOADING ZONE

ELROD ELEMENTARY SCHOOL

NO PARKING SCHOOL DAYS

St Name Signs

RESIDENCE

ALLEY

ADT = 1400

FIFTH STREET

40' BC-BC

ALLEY

RESIDENCE

RESIDENCE

ALLEY

THIRD AVENUE WEST

ADT = 600

3rd AVE W

North

#2

#7

6th ST

#1,3,4,5,6

#3,4 = Accident Reference Numbers

COLLISION DIAGRAM

THIRD AVE W

15 Peds

3 Peds

18 Peds

15 Peds

FIFTH ST

TRAFFIC MOVEMENTS 12:00 - 1:00 PM 9/30/92

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

THIRD AVENUE WEST & FIFTH STREET

EXISTING CONDITIONS

SHEET 28

All Gardes < 2%

SCALE: 1" = 40'

PAINT CURBS YELLOW AS SHOWN

ELROD ELEMENTARY SCHOOL

NEW ST. NAME SIGNS (4)

NEW

NEW

NEW

NEW

NEW

NEW

NEW

REMOVE St. Name Signs

REMOVE SIDEWALK SECTIONS (TYP)

NEW SIDEWALKS (TYP)

OBLITERATE

OBLITERATE

NEW LADDER X-WALK & STOP BAR MARKS

RESIDENCE

RESIDENCE

RESIDENCE

ALLEY

ALLEY

ALLEY

31' BC-BC

40' BC-BC

31' BC-BC

30'

20'

30'

60'

80'

90'

ADT = 450

ADT = 1400

ADT = 1400

ADT = 600

FIFTH STREET

THIRD AVENUE WEST

THIRD AVE W & FIFTH ST. — COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (.6 SF)	12	Ea	$100.00	$1,200.00
2	NEW SIGNS (6.1 to 10 SF)	3	Ea	$140.00	$420.00
3	RELOCATE SIGNS	2	Ea	$50.00	$100.00
4	REMOVE SIGNS	1	Ea	$20.00	$20.00
5	PAVE. MARKINGS (PAINT)	8	Gal	$15.00	$120.00
6	PAVE. MARKING PLASTIC	120	SF	$3.00	$360.00
7	PLASTIC WORDS & SYMBOLS	0	SF	$12.00	$0.00
8	CURB PAINT - YELLOW	3	Gal	$15.00	$45.00
9	NEW CURB & GUTTER	0	LF	$10.00	$0.00
10	NEW SIDEWALK	36	SY	$26.00	$876.00
11	TRIM TREES	0	LS	$100.00	$0.00
12	MISCELLANEOUS	1	LS	$400.00	$400.00
	TOTAL CONSTRUCTION COSTS =				$3,540.00

THIRD AVE & FIFTH ST

ACCIDENT TYPE	# ACC. IN PERIOD IF	# ACC. IN PERIOD PD	EST. % CHANGE	CHANGE IN # ACC. IF	CHANGE IN # ACC. PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	3	4	60%	1.8	2.4
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	0	0%	0.0	0.0
REAR END	0	0	0%	0.0	0.0
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	0	0%	0.0	0.0
TOTALS:	3	4		1.8	2.4
% REDUCTION IN INJURY/FATAL ACCIDENTS =				60.0%	
% REDUCTION IN PROPERTY DAMAGE ACCIDENTS =					60.0%

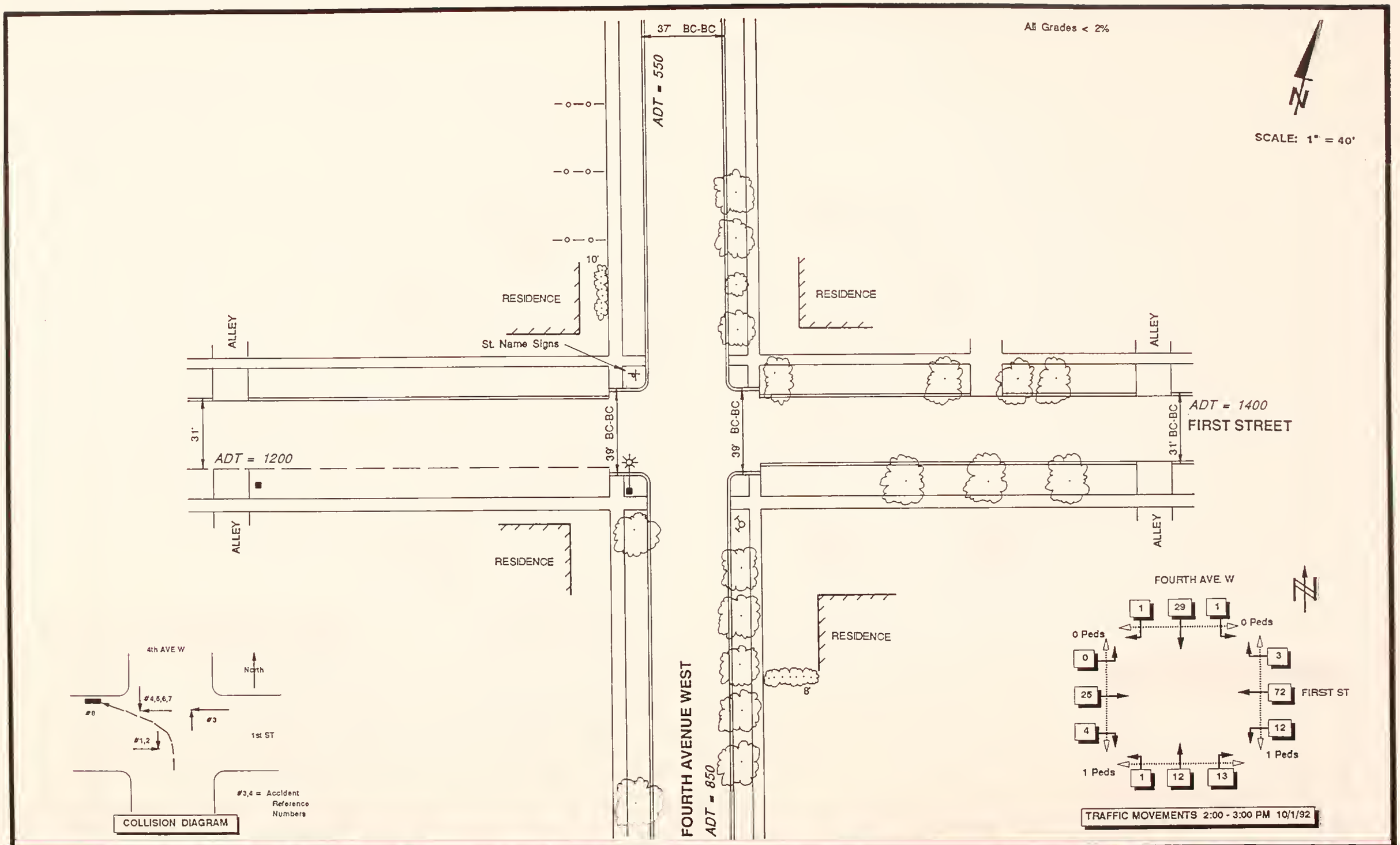
MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

THIRD AVENUE WEST & FIFTH STREET

SHORT TERM IMPROVEMENTS

SHEET 29



MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

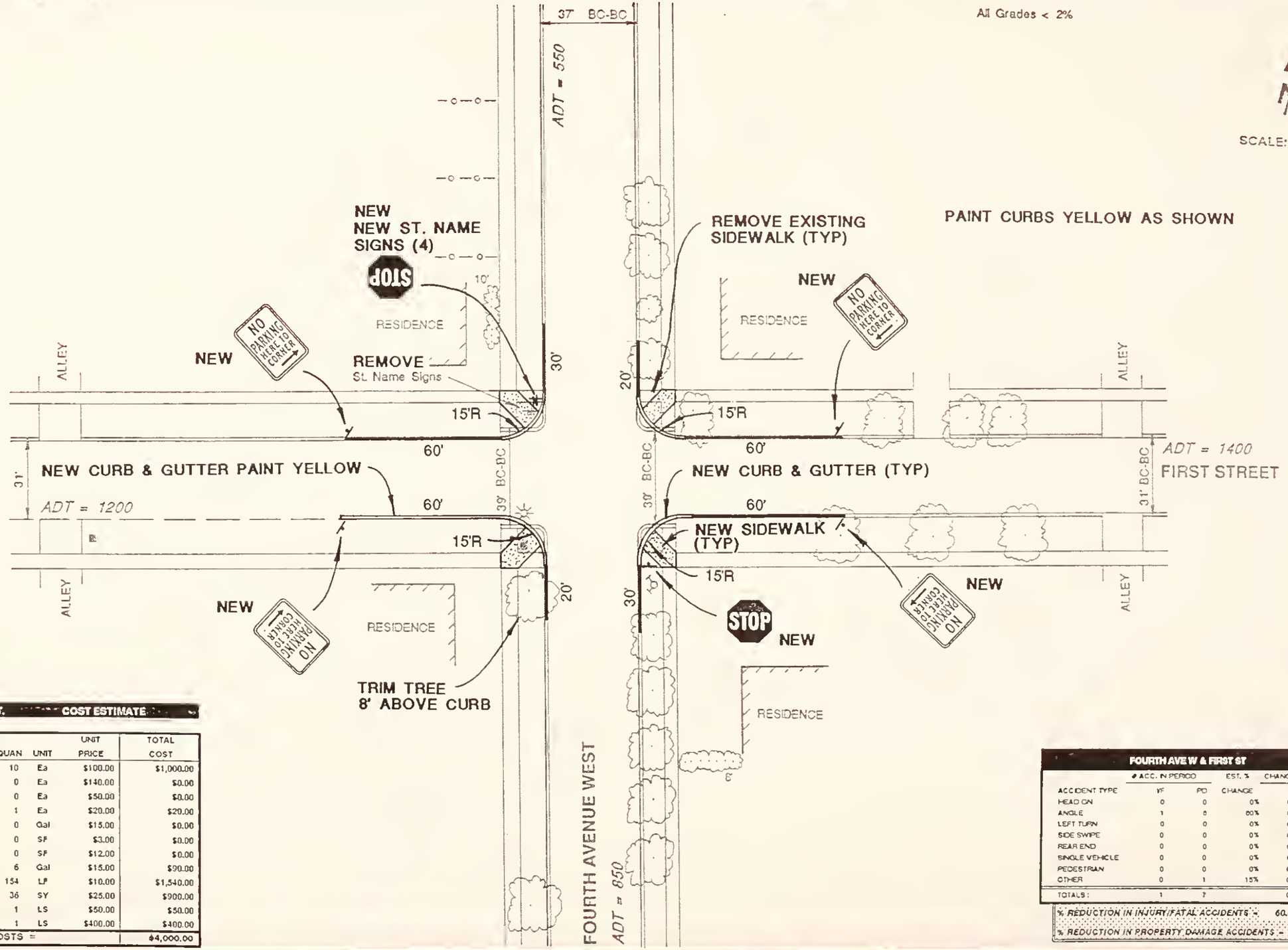
FOURTH AVENUE WEST & FIRST STREET

EXISTING CONDITIONS

SHEET 30

All Grades < 2%

SCALE: 1" = 40'



FOURTH AVE. W & FIRST ST. — COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (,6 SF)	10	Ea	$100.00	$1,000.00
2	NEW SIGNS (6.1 to 10 SF)	0	Ea	$140.00	$0.00
3	RELOCATE SIGNS	0	Ea	$50.00	$0.00
4	REMOVE SIGNS	1	Ea	$20.00	$20.00
5	PAVE. MARKINGS (PAINT)	0	Gal	$15.00	$0.00
6	PAVE. MARKING PLASTIC	0	SF	$3.00	$0.00
7	PLASTIC WORDS & SYMBOLS	0	SF	$12.00	$0.00
8	CURB PAINT - YELLOW	6	Gal	$15.00	$90.00
9	NEW CURB & GUTTER	154	LF	$10.00	$1,540.00
10	NEW SIDEWALK	36	SY	$25.00	$900.00
11	TRIM TREES	1	LS	$50.00	$50.00
12	MISCELLANEOUS	1	LS	$400.00	$400.00
	TOTAL CONSTRUCTION COSTS =				$4,000.00

FOURTH AVE W & FIRST ST

	# ACC. IN PERIOD		EST. %	CHANGE IN # ACC.	
ACCIDENT TYPE	PI	PD	CHANGE	PI	PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	1	5	80%	0.8	3.9
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	0	0%	0.0	0.0
REAR END	0	0	0%	0.0	0.0
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	1	15%	0.0	0.2
TOTALS:	1	7		0.0	3.7

% REDUCTION IN INJURY/FATAL ACCIDENTS = 60.0%

% REDUCTION IN PROPERTY DAMAGE ACCIDENTS = 53.6%

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers
1127 Alderson Ave. #204
Billings, MT 59102

FOURTH AVENUE WEST & FIRST STREET

SHORT TERM IMPROVEMENTS

SHEET 31

All Gardes < 1%

SCALE: 1" = 40'

RESIDENCE

51' BC-BC

ADT = 2500

2 HR PARKING 9:00 AM TO 6:00 PM

NO PARKING HERE TO CORNER

4-WAY STOP

Parking Lot

BUSINESS

ALLEY

COMPACT CAR PARKING ONLY

STOP 4-WAY

BUSINESS

Parking Lot

BUSINESS

ALLEY

ADT = 4600

SECOND STREET

45' BC-BC

ADT = 3800

ALLEY

4-WAY STOP

St. Name Signs

BUSINESS

BUS STOP

SECOND AVENUE WEST

ADT = 3800

STOP 4-WAY

BUSINESS

BUSINESS

ALLEY

NO PARKING ANY TIME

SECOND AVE. W

18 Peds

6 38 14

11 Peds

12

131

20

17

70

38

SECOND ST

22 Peds

18 Peds

27 89 51

TRAFFIC MOVEMENTS 10:00 - 11:00 AM 10/1/92

2nd AVE W

North

#10 #6 #7 #8 #1

2nd ST.

#9 #4 #5 #2 #3

#3,4 = Accident Reference Numbers

COLLISION DIAGRAM

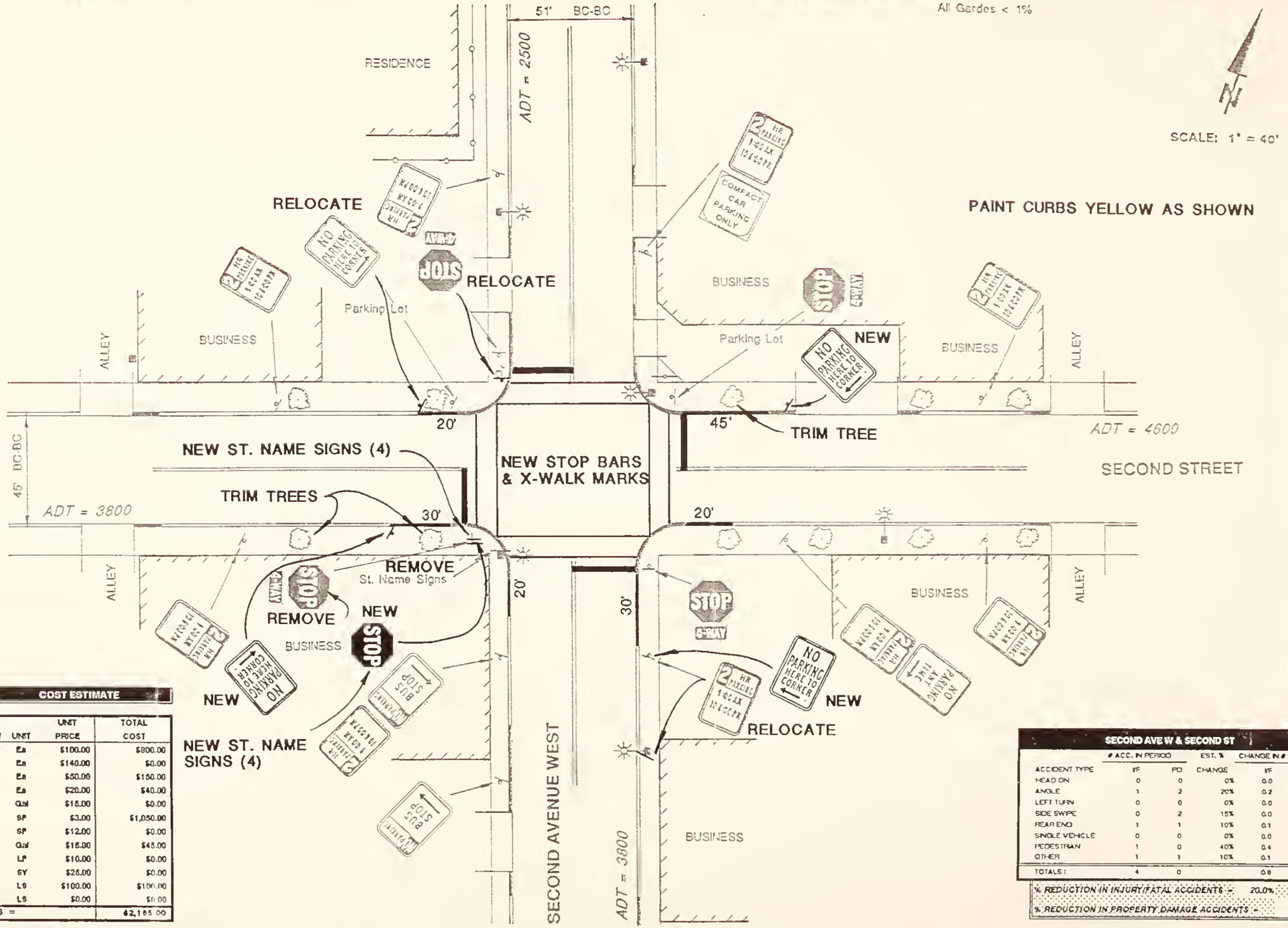
MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

SECOND AVENUE WEST & SECOND STREET

EXISTING CONDITIONS

SHEET 32



SECOND AVE. W & SECOND ST. — COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (.6 SF)	8	Ea	$100.00	$800.00
2	NEW SIGNS (6.1 to 10 SF)	0	Ea	$140.00	$0.00
3	RELOCATE SIGNS	3	Ea	$50.00	$150.00
4	REMOVE SIGNS	2	Ea	$20.00	$40.00
5	PAVE. MARKINGS (PAINT)	0	Gal	$15.00	$0.00
6	PAVE. MARKING PLASTIC	350	SF	$3.00	$1,050.00
7	PLASTIC WORDS & SYMBOLS	0	SF	$12.00	$0.00
8	CURB PAINT - YELLOW	3	Gal	$15.00	$45.00
9	NEW CURB & GUTTER	0	LF	$10.00	$0.00
10	NEW SIDEWALK	0	SY	$26.00	$0.00
11	TRIM TREES	1	LS	$100.00	$100.00
12	MISCELLANEOUS	0	LS	$0.00	$0.00
	TOTAL CONSTRUCTION COSTS =				$2,185.00

SECOND AVE W & SECOND ST

ACCIDENT TYPE	# ACC. IN PERIOD WF	PD	EST. % CHANGE	CHANGE IN # ACC. WF	PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	1	2	20%	0.2	0.4
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	2	15%	0.0	0.3
REAR END	1	1	10%	0.1	0.1
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	1	0	40%	0.4	0.0
OTHER	1	1	10%	0.1	0.1
TOTALS:	4	0		0.8	0.9
% REDUCTION IN INJURY/FATAL ACCIDENTS =			20.0%		
% REDUCTION IN PROPERTY DAMAGE ACCIDENTS =			15.0%		

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers
1127 Alderson Ave. #204
Billings, MT 59102

SECOND AVENUE WEST & SECOND STREET

SHORT TERM IMPROVEMENTS

SHEET 33

All Gardes < 1%

Both Streets Have Parabolic
X-section with Moderate Crown

SCALE: 1" = 40'

43' BC-BC

ADT = 4600

RESIDENCE

ALLEY

Mailbox

STOP

RESIDENCE

ALLEY

ADT = 2400

TWELFTH STREET

34' BC-BC

ADT = 400

ALLEY

St. Name Signs

STOP

RESIDENCE

FIRST AVENUE WEST

ADT = 2500

RESIDENCE

Wood Slats

ALLEY

1st AVE W

North

#2,3

#5

TWELFTH

#1

#4

#6

#3,4 = Accident Reference Numbers

COLLISION DIAGRAM

FIRST AVE. W

3 Peds

0 Peds

2 Peds

1 Peds

TWELFTH ST

3	96	108	
5			94
7			12
1			3
	10	110	3

TRAFFIC MOVEMENTS 11:00 - 12:00 AM 9/30/92

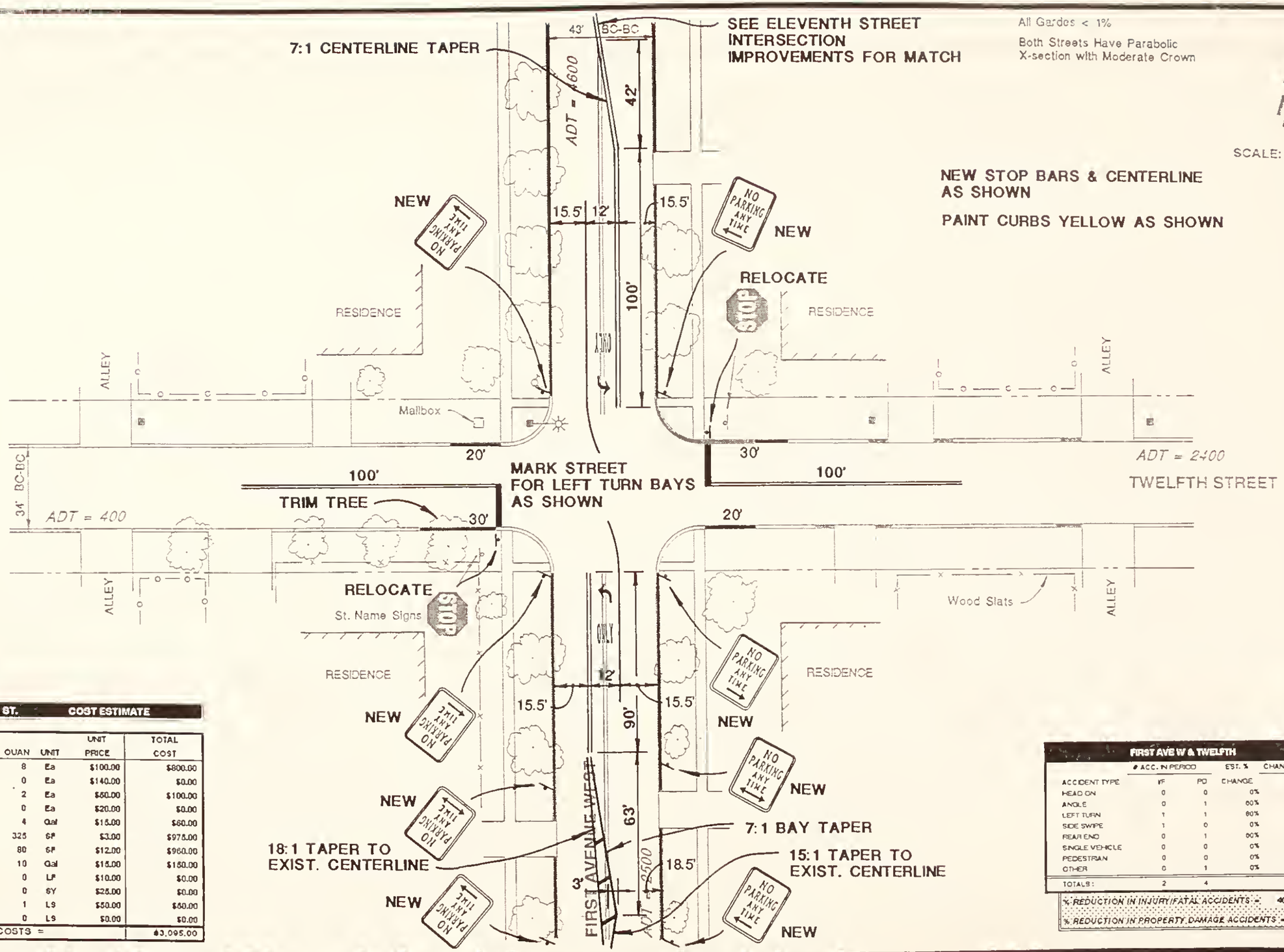
MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

FIRST AVENUE WEST & TWELFTH STREET

EXISTING CONDITIONS

SHEET 34



FIRST AVE. W & TWELFTH ST. — COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (,6 SF)	8	Ea	$100.00	$800.00
2	NEW SIGNS (6.1 to 10 SF)	0	Ea	$140.00	$0.00
3	RELOCATE SIGNS	2	Ea	$50.00	$100.00
4	REMOVE SIGNS	0	Ea	$20.00	$0.00
5	PAVE. MARKINGS (PAINT)	4	Gal	$15.00	$60.00
6	PAVE. MARKING PLASTIC	325	SF	$3.00	$975.00
7	PLASTIC WORDS & SYMBOLS	80	SF	$12.00	$960.00
8	CURB PAINT - YELLOW	10	Gal	$15.00	$150.00
9	NEW CURB & GUTTER	0	LF	$10.00	$0.00
10	NEW SIDEWALK	0	SY	$25.00	$0.00
11	TRIM TREES	1	LS	$50.00	$50.00
12	MISCELLANEOUS	0	LS	$0.00	$0.00
	TOTAL CONSTRUCTION COSTS =				$3,095.00

FIRST AVE W & TWELFTH

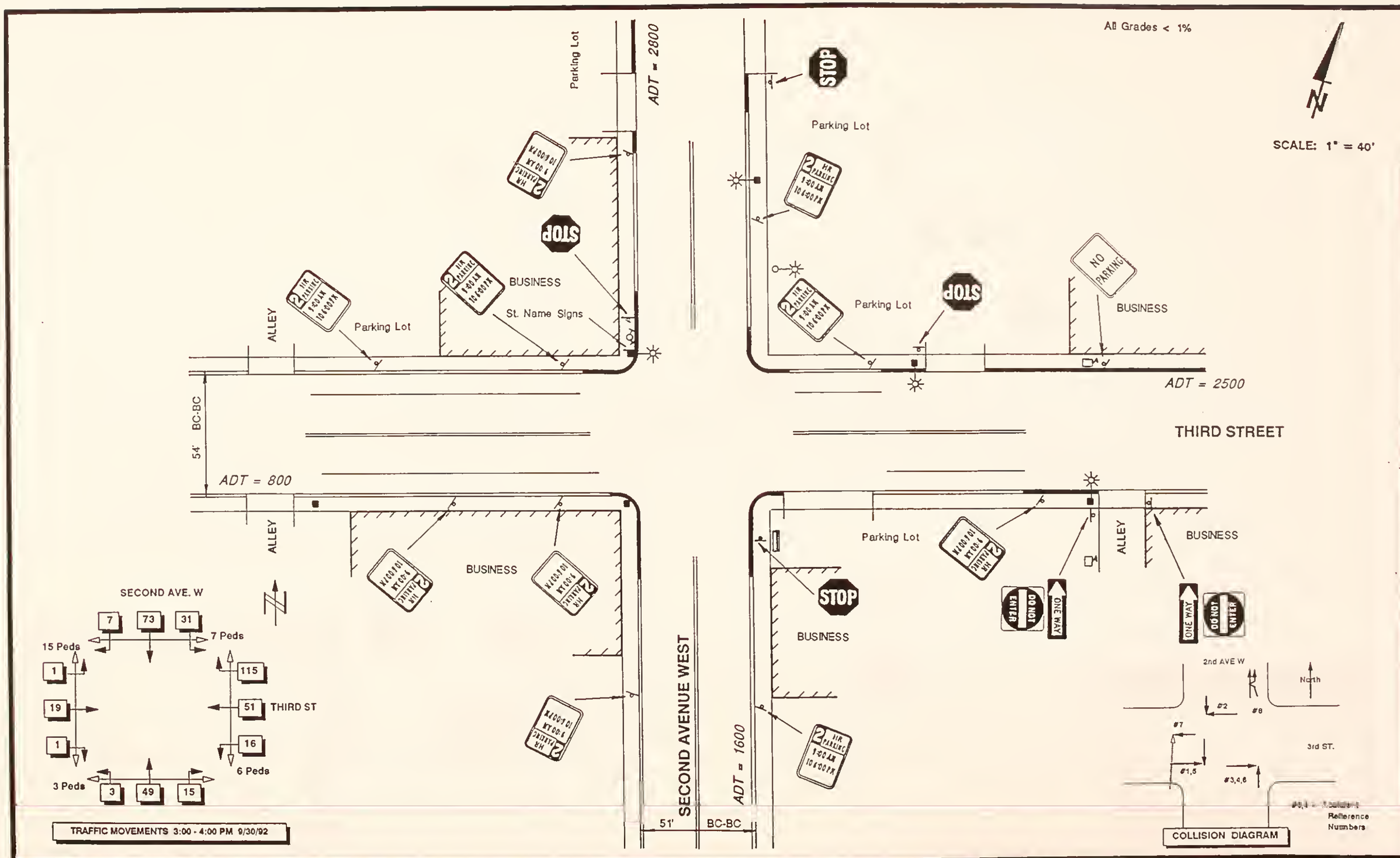
ACCIDENT TYPE	# ACC. IN PERIOD IF	# ACC. IN PERIOD PD	EST. % CHANGE	CHANGE IN # ACC. IF	CHANGE IN # ACC. PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	0	1	60%	0.0	0.6
LEFT TURN	1	1	80%	0.8	0.8
SIDE SWIPE	1	0	0%	0.0	0.0
REAR END	0	1	60%	0.0	0.0
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	1	0%	0.0	0.0
TOTALS:	2	4		0.8	2.0
% REDUCTION IN INJURY/FATAL ACCIDENTS =				40.0%	
% REDUCTION IN PROPERTY DAMAGE ACCIDENTS =					50.0%

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers
1127 Alderson Ave. #204
Billings, MT 59102

FIRST AVENUE WEST & TWELFTH STREET

SHORT TERM IMPROVEMENTS

SHEET 35



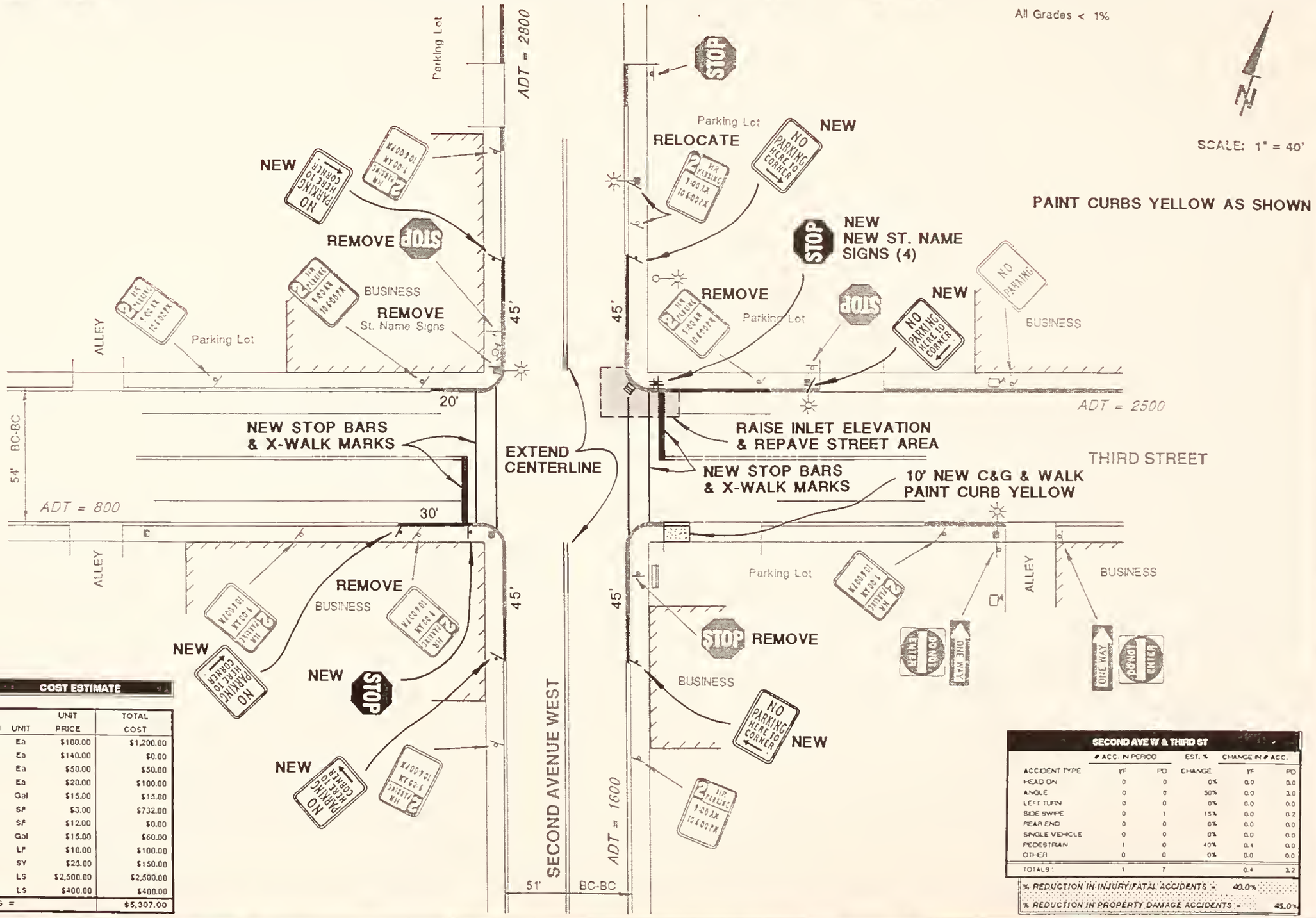
MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

SECOND AVENUE WEST & THIRD STREET

EXISTING CONDITIONS

SHEET 36



SECOND AVE. W & THIRD ST. — COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (.6 SF)	12	Ea	$100.00	$1,200.00
2	NEW SIGNS (6.1 to 10 SF)	0	Ea	$140.00	$0.00
3	RELOCATE SIGNS	1	Ea	$50.00	$50.00
4	REMOVE SIGNS	5	Ea	$20.00	$100.00
5	PAVE. MARKINGS (PAINT)	1	Gal	$15.00	$15.00
6	PAVE. MARKING PLASTIC	244	SF	$3.00	$732.00
7	PLASTIC WORDS & SYMBOLS	0	SF	$12.00	$0.00
8	CURB PAINT - YELLOW	4	Gal	$15.00	$60.00
9	NEW CURB & GUTTER	10	LF	$10.00	$100.00
10	NEW SIDEWALK	6	SY	$25.00	$150.00
11	DRAINAGE & PAVING	1	LS	$2,500.00	$2,500.00
12	MISCELLANEOUS	1	LS	$400.00	$400.00
	TOTAL CONSTRUCTION COSTS =				$5,307.00

SECOND AVE W & THIRD ST

ACCIDENT TYPE	# ACC. IN PERIOD YF	# ACC. IN PERIOD PD	EST. % CHANGE	CHANGE IN # ACC. YF	CHANGE IN # ACC. PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	0	6	50%	0.0	3.0
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	1	15%	0.0	0.2
REAR END	0	0	0%	0.0	0.0
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	1	0	40%	0.4	0.0
OTHER	0	0	0%	0.0	0.0
TOTALS:	1	7		0.4	3.2
% REDUCTION IN INJURY/FATAL ACCIDENTS =			40.0%		
% REDUCTION IN PROPERTY DAMAGE ACCIDENTS =			45.0%		

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers
1127 Alderson Ave. #204
Billings, MT 59102

SECOND AVENUE WEST & THIRD STREET

SHORT TERM IMPROVEMENTS

SHEET 37

All Grades < 1%

SCALE: 1" = 40'

51' BC-BC

ADT = 7300

NO PARKING ANY TIME

NO PARKING ANY TIME

Parking Lot

STOP

Ad Sign

RESIDENCE

ALLEY

Garage

ALLEY

ADT = 2200

MONTANA STREET

41' BC-BC

ADT = 1700

ALLEY

STOP

St. Name Signs

BUSINESS

Ad Sign

FIFTH AVENUE WEST

ADT = 8200

RESIDENCE

ALLEY

FIFTH AVE. W.

20 255 21

1 Peds

0 Peds

10

9

53

70

17

39

1 Peds

0 Peds

59 330 62

MONTANA ST

TRAFFIC MOVEMENTS 4:00 - 5:00 PM 9/29/92

6th AVE W

North

#3,4

#7

#10,11

#2

#1,6

MONTANA

#5

#12,13

#8

#9

#3,4 = Accident Reference Numbers

COLLISION DIAGRAM

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

FIFTH AVENUE WEST & MONTANA STREET

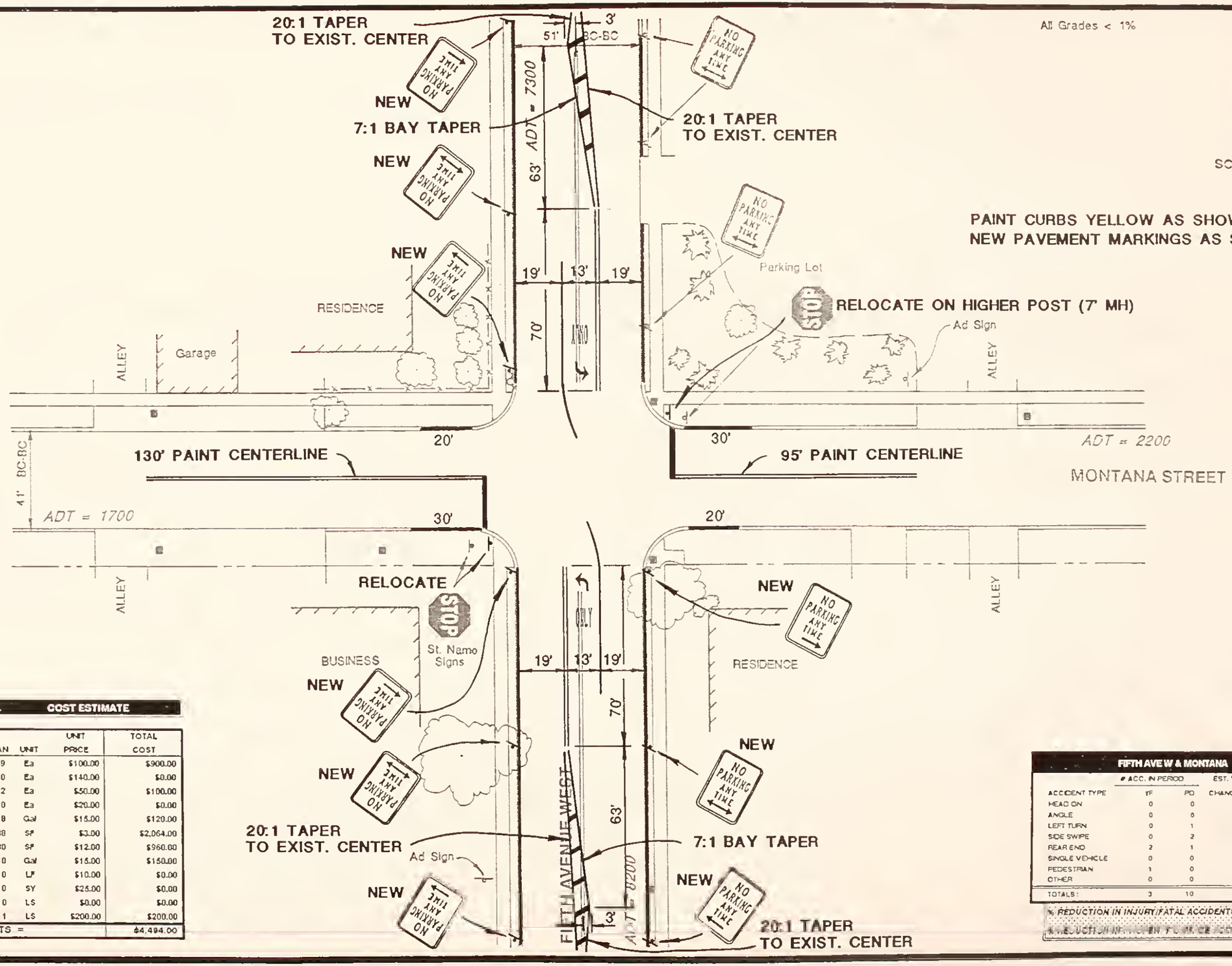
EXISTING CONDITIONS

SHEET 38

All Grades < 1%

SCALE: 1" = 40'

PAINT CURBS YELLOW AS SHOWN
NEW PAVEMENT MARKINGS AS SHOWN



FIFTH AVE. W & MONTANA ST. COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (.6 SF)	9	Ea	$100.00	$900.00
2	NEW SIGNS (6.1 to 10 SF)	0	Ea	$140.00	$0.00
3	RELOCATE SIGNS	2	Ea	$50.00	$100.00
4	REMOVE SIGNS	0	Ea	$20.00	$0.00
5	PAVE. MARKINGS (PAINT)	8	Gal	$15.00	$120.00
6	PAVE. MARKING PLASTIC	688	SF	$3.00	$2,064.00
7	PLASTIC WORDS & SYMBOLS	80	SF	$12.00	$960.00
8	CURB PAINT - YELLOW	10	Gal	$15.00	$150.00
9	NEW CURB & GUTTER	0	LF	$10.00	$0.00
10	NEW SIDEWALK	0	SY	$25.00	$0.00
11	TRIM TREES	0	LS	$0.00	$0.00
12	MISCELLANEOUS	1	LS	$200.00	$200.00
	TOTAL CONSTRUCTION COSTS =				$4,494.00

FIFTH AVE W & MONTANA

ACCIDENT TYPE	# ACC. IN PERIOD IF	# ACC. IN PERIOD PD	EST. % CHANGE	CHANGE IN # ACC. IF	CHANGE IN # ACC. PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	0	0	50%	0.0	3.0
LEFT TURN	0	1	60%	0.0	0.6
SIDE SWIPE	0	2	40%	0.0	0.8
REAR END	2	1	40%	0.8	0.4
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	1	0	10%	0.1	0.0
OTHER	0	0	0%	0.0	0.0
TOTALS:	3	10		0.9	4.8
% REDUCTION IN INJURY/FATAL ACCIDENTS =				30.0%	
% REDUCTION IN PROPERTY DAMAGE ACCIDENTS =					48.0%

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers
1127 Alderson Ave. #204
Billings, MT 59102

FIFTH AVENUE WEST & MONTANA STREET

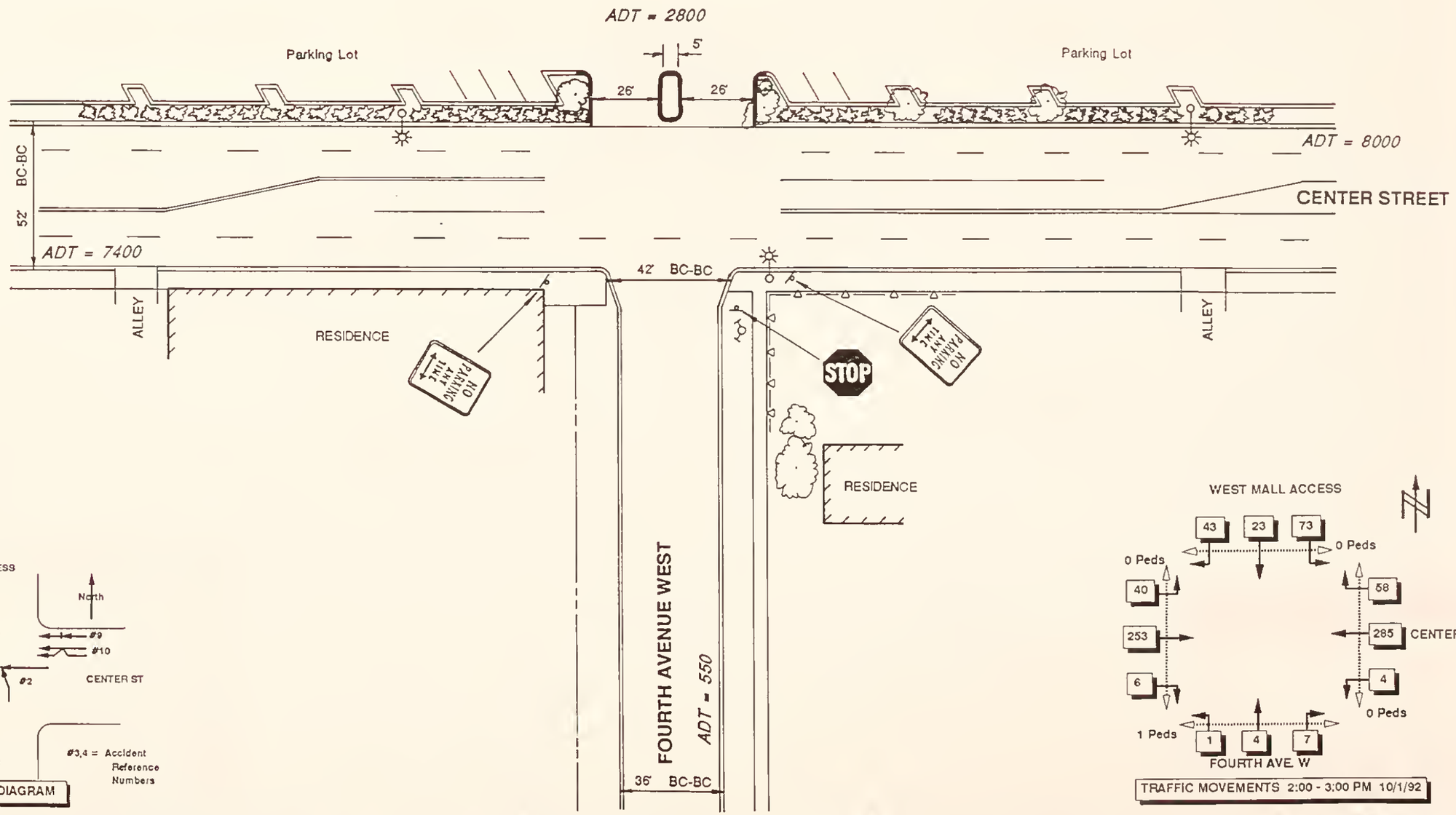
SHORT TERM IMPROVEMENTS

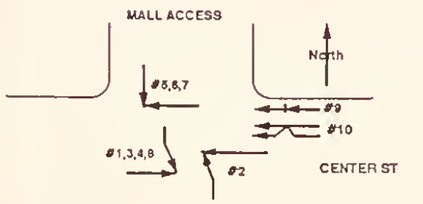
SHEET 39

All Gardes < 1%

KALISPELL CENTER MALL

SCALE: 1" = 40'





#3,4 = Accident Reference Numbers

COLLISION DIAGRAM

TRAFFIC MOVEMENTS 2:00 - 3:00 PM 10/1/92

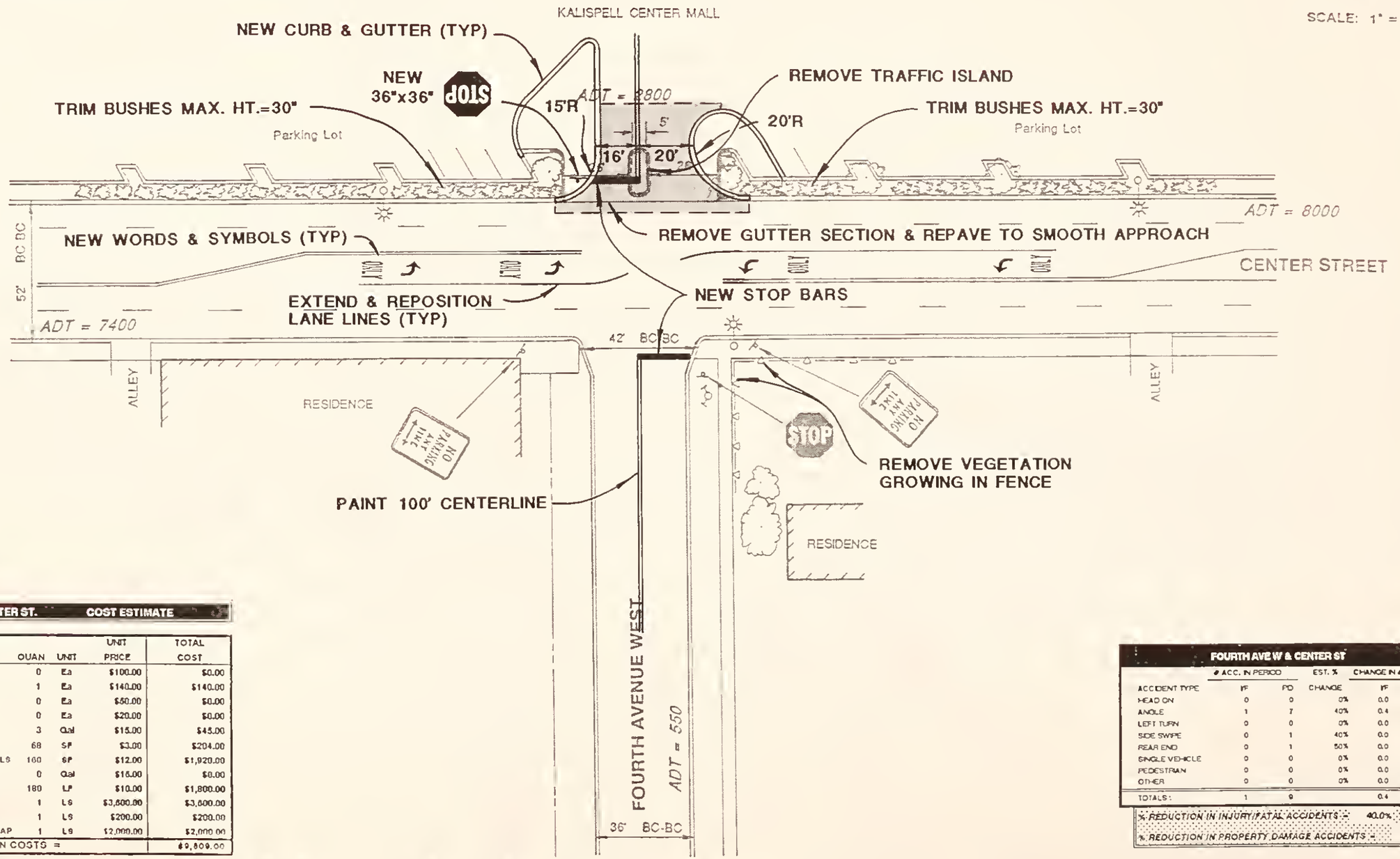
MARVIN & ASSOCIATES Traffic, Transportation & Civil Engineers	1127 Alderson Ave. #204 Billings, MT 59102	FOURTH AVENUE WEST & CENTER STREET	EXISTING CONDITIONS SHEET 40

RECONSTRUCTION WIHIN PARKING LOT REQUIRED
TO ACCOMODATE PARKING & CIRCULATION ALONG
WITH ACCESS CHANGES

All Gardes < 1%

NOTE:
DETAILED DESIGN & SPECIFICATIONS ARE
REQUIRED TO ADEQUATELY IMPLEMENT
THESE IMPROVEMENTS

SCALE: 1" = 40'



FOURTH AVE. W & CENTER ST. COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (,6 SF)	0	Ea	$100.00	$0.00
2	NEW SIGNS (6.1 to 10 SF)	1	Ea	$140.00	$140.00
3	RELOCATE SIGNS	0	Ea	$50.00	$0.00
4	REMOVE SIGNS	0	Ea	$20.00	$0.00
5	PAVE. MARKINGS (PAINT)	3	Gal	$15.00	$45.00
6	PAVE. MARKING PLASTIC	68	SF	$3.00	$204.00
7	PLASTIC WORDS & SYMBOLS	160	SF	$12.00	$1,920.00
8	CURB PAINT - YELLOW	0	Gal	$16.00	$0.00
9	NEW CURB & GUTTER	180	LF	$10.00	$1,800.00
10	STREET CONSTRUCTION	1	LS	$3,600.00	$3,600.00
11	TRIM TREES	1	LS	$200.00	$200.00
12	MISCELLANEOUS & LADSCAP	1	LS	$2,000.00	$2,000.00
	TOTAL CONSTRUCTION COSTS =				$9,909.00

FOURTH AVE W & CENTER ST

ACCIDENT TYPE	# ACC. IN PERIOD PF	PD	EST. % CHANGE	CHANGE IN # ACC. PF	PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	1	7	40%	0.4	2.8
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	1	40%	0.0	0.4
REAR END	0	1	50%	0.0	0.5
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	0	0%	0.0	0.0
TOTALS:	1	9		0.4	3.7

% REDUCTION IN INJURY/FATAL ACCIDENTS = 40.0%

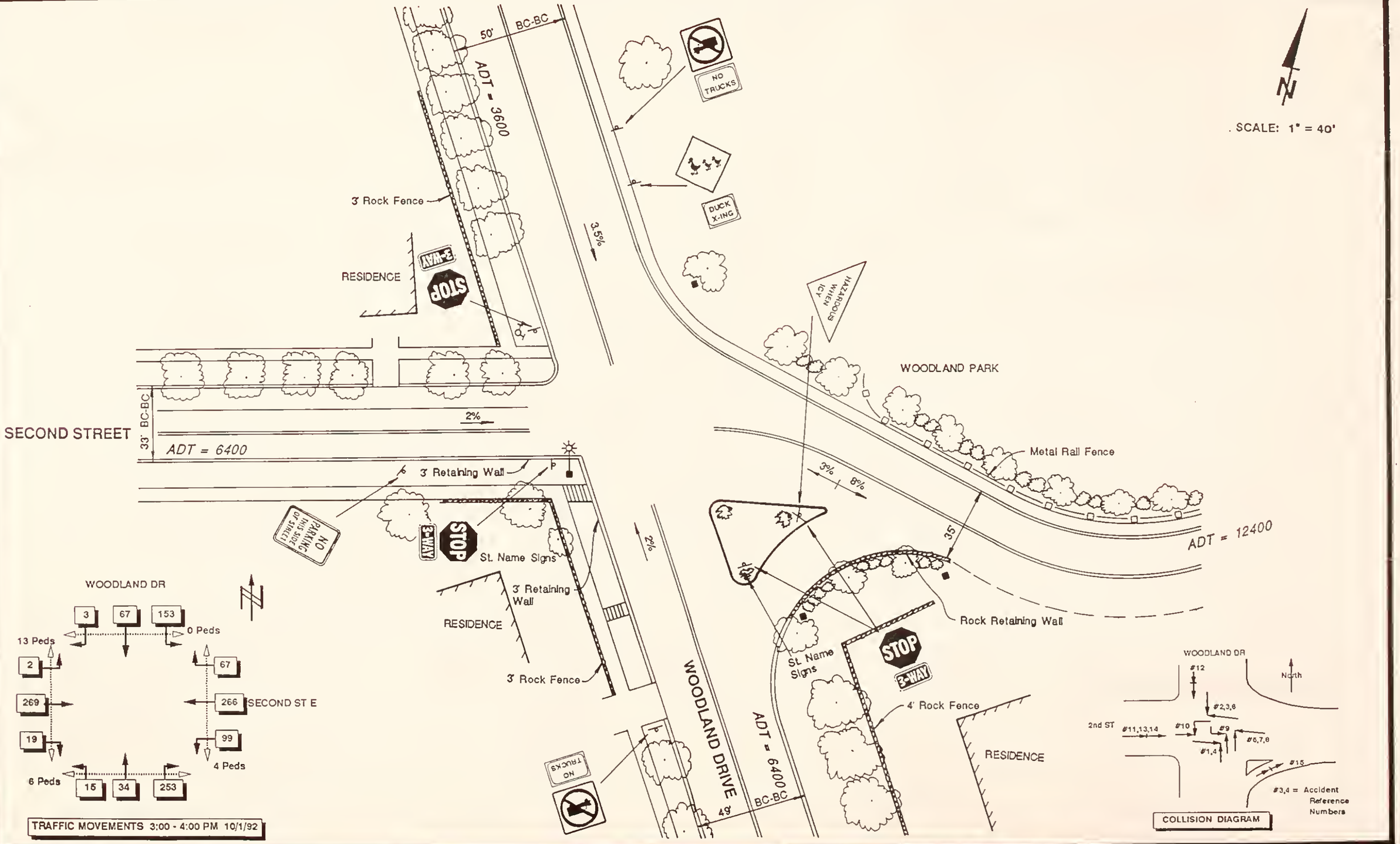
% REDUCTION IN PROPERTY DAMAGE ACCIDENTS = 41.1%

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers
1127 Alderson Ave. #204
Billings, MT 59102

FOURTH AVENUE WEST & CENTER STREET

SHORT TERM IMPROVEMENTS

SHEET 41



MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

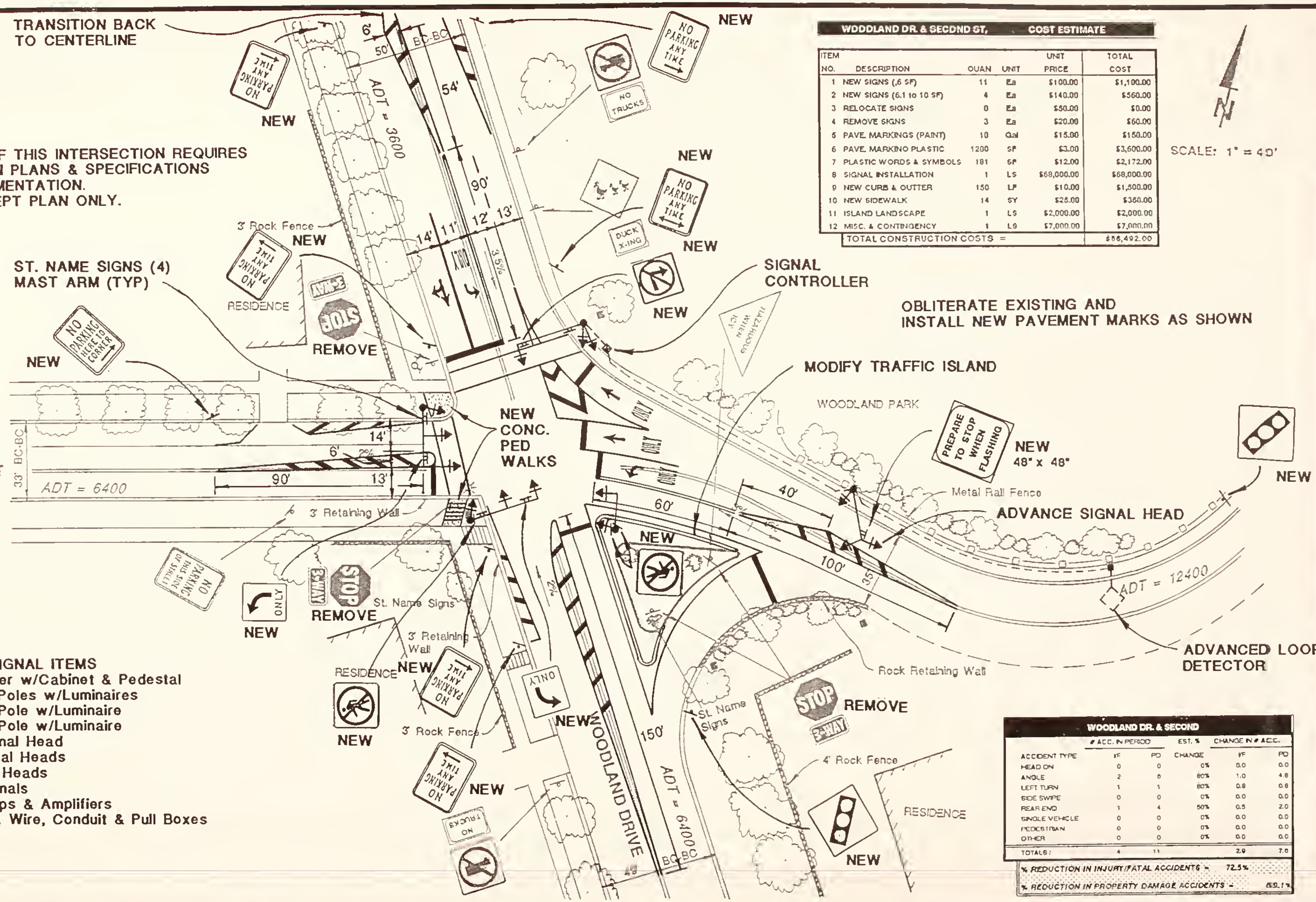
WOODLAND DRIVE & SECOND STREET

EXISTING CONDITIONS

SHEET 42

NOTE:

COMPLEXITIES OF THIS INTERSECTION REQUIRES DETAILED DESIGN PLANS & SPECIFICATIONS PRIOR TO IMPLEMENTATION.
THIS IS A CONCEPT PLAN ONLY.



WOODLAND DR. & SECOND ST., COST ESTIMATE					
ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (,6 SF)	11	Ea	$100.00	$1,100.00
2	NEW SIGNS (6.1 to 10 SF)	4	Ea	$140.00	$560.00
3	RELOCATE SIGNS	0	Ea	$50.00	$0.00
4	REMOVE SIGNS	3	Ea	$20.00	$60.00
5	PAVE. MARKINGS (PAINT)	10	Gal	$15.00	$150.00
6	PAVE. MARKING PLASTIC	1200	SF	$3.00	$3,600.00
7	PLASTIC WORDS & SYMBOLS	181	SF	$12.00	$2,172.00
8	SIGNAL INSTALLATION	1	LS	$68,000.00	$68,000.00
9	NEW CURB & GUTTER	150	LF	$10.00	$1,500.00
10	NEW SIDEWALK	14	SY	$25.00	$350.00
11	ISLAND LANDSCAPE	1	LS	$2,000.00	$2,000.00
12	MISC. & CONTINGENCY	1	LS	$7,000.00	$7,000.00
	TOTAL CONSTRUCTION COSTS =				$86,492.00

NEW TRAFFIC SIGNAL ITEMS
8 Phase Controller w/Cabinet & Pedestal
3-20' Mast Arm Poles w/Luminaires
1-25' Mast Arm Pole w/Luminaire
1-30' Mast Arm Pole w/Luminaire
1-12" Amber Signal Head
7-12x12x12 Signal Heads
6-12x8x8 Signal Heads
4 Pedestrian Signals
15 Detector Loops & Amplifiers
Opticom System, Wire, Conduit & Pull Boxes

WOODLAND DR. & SECOND	# ACC. IN PERIOD		EST. %	CHANGE IN # ACC.	
ACCIDENT TYPE	I/F	PD	CHANGE	I/F	PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	2	6	80%	1.0	4.8
LEFT TURN	1	1	80%	0.8	0.8
SIDE SWIPE	0	0	0%	0.0	0.0
REAR END	1	4	50%	0.5	2.0
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	0	0%	0.0	0.0
TOTALS:	4	11		2.9	7.6

% REDUCTION IN INJURY/FATAL ACCIDENTS = 72.5%

% REDUCTION IN PROPERTY DAMAGE ACCIDENTS = 69.1%

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

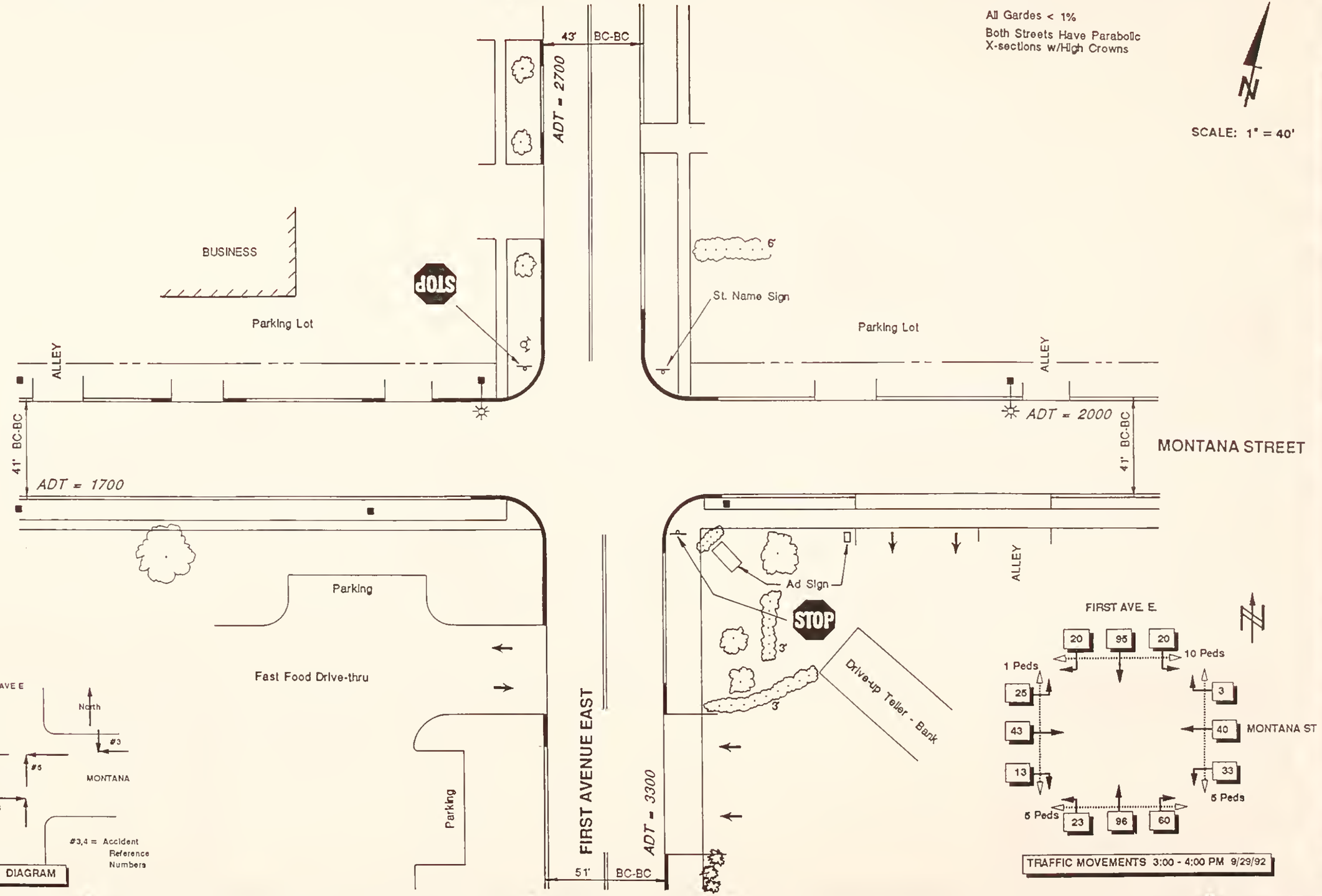
WOODLAND DRIVE & SECOND STREET

SHORT TERM IMPROVEMENTS

All Gardes < 1%

Both Streets Have Parabolic X-sections w/High Crowns

SCALE: 1" = 40'



MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

FIRST AVENUE EAST & MONTANA STREET

EXISTING CONDITIONS

SHEET 44

All Grades < 1%
Both Streets Have Parabolic X-sections w/High Crowns

SCALE: 1" = 40'

PAINT CURBS YELLOW AS SHOWN

43' BC-BC

ADT = 2700

BUSINESS

REMOVE STOP

Parking Lot

ALLEY

PAINT CENTERLINE TO ALLEY

200'

ADT = 1700

30'

41' BC-BC

NEW

STOP

NEW 36"x36"

Parking

Fast Food Drive-thru

Parking

FIRST AVENUE EAST

ADT = 3300

51' BC-BC

50'

6'

RELOCATE St. Name Sign

STOP

NEW 36"x36"

Parking Lot

ALLEY

NEW

200'

ADT = 2000

41' BC-BC

MONTANA STREET

PAINT CENTERLINE TO ALLEY

20'

35'

ALLEY

Ad Sign

REMOVE

STOP

3'

3'

Drive-up Teller - Bank

FIRST AVE. E & MONTANA ST. COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (,6 SF)	0	Ea	$100.00	$0.00
2	NEW SIGNS (6.1 to 10 SF)	4	Ea	$140.00	$560.00
3	RELOCATE SIGNS	1	Ea	$50.00	$50.00
4	REMOVE SIGNS	2	Ea	$20.00	$40.00
5	PAVE. MARKINGS (PAINT)	2	Gal	$15.00	$30.00
6	PAVE. MARKING PLASTIC	80	SF	$3.00	$240.00
7	PLASTIC WORDS & SYMBOLS	0	SF	$12.00	$0.00
8	CURB PAINT - YELLOW	2	Gal	$15.00	$30.00
9	NEW CURB & GUTTER	0	LF	$10.00	$0.00
10	NEW SIDEWALK	0	SY	$25.00	$0.00
11	TRIM TREES	0	LS	$0.00	$0.00
12	MISCELLANEOUS	0	LS	$0.00	$0.00
	TOTAL CONSTRUCTION COSTS =				$950.00

FIRST AVE E & MONTANA

ACCIDENT TYPE	# ACC. IN PERIOD Yr	# ACC. IN PERIOD PD	EST. % CHANGE	CHANGE IN # ACC. Yr	CHANGE IN # ACC. PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	0	0	40%	0.0	2.4
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	0	0%	0.0	0.0
REAR END	0	0	0%	0.0	0.0
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	0	0%	0.0	0.0
TOTALS:	0	0		0.0	2.4

% REDUCTION IN INJURY/FATAL ACCIDENTS = ERR

% REDUCTION IN PROPERTY DAMAGE ACCIDENTS = 40.0%

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

FIRST AVENUE EAST & MONTANA STREET

SHORT TERM IMPROVEMENTS

SHEET 45

All Grades < 1%

SCALE: 1" = 40'

38'

ADT = 11200

NO PARKING BETWEEN SIGNS

RESIDENCE

4-WAY

STOP

TWO MILE ROAD

21'

ADT = 4100

4-WAY

STOP

St. Name Signs

Fish & Game Parking Lot

Ad Sign

MERIDIAN ROAD

ONLY

43'

ADT = 12600

50'

4-WAY

STOP

STOP

STOP

4-WAY

NO PARKING BETWEEN SIGNS

AHEAD

FAIRGROUNDS

30'

ADT = 600

MERIDIAN RD

#10

North

#1,2,3

TWO MILE RD

FAIRGROUNDS

#11

#5

#9

#12

#8

#4,6,7

#3,4 = Accident Reference Numbers

COLLISION DIAGRAM

MERIDIAN RD

48 369 4

0 Peds

0 Peds

72

6

TWO MILE RD

FAIRGROUNDS

6

4

97

12

0 Peds

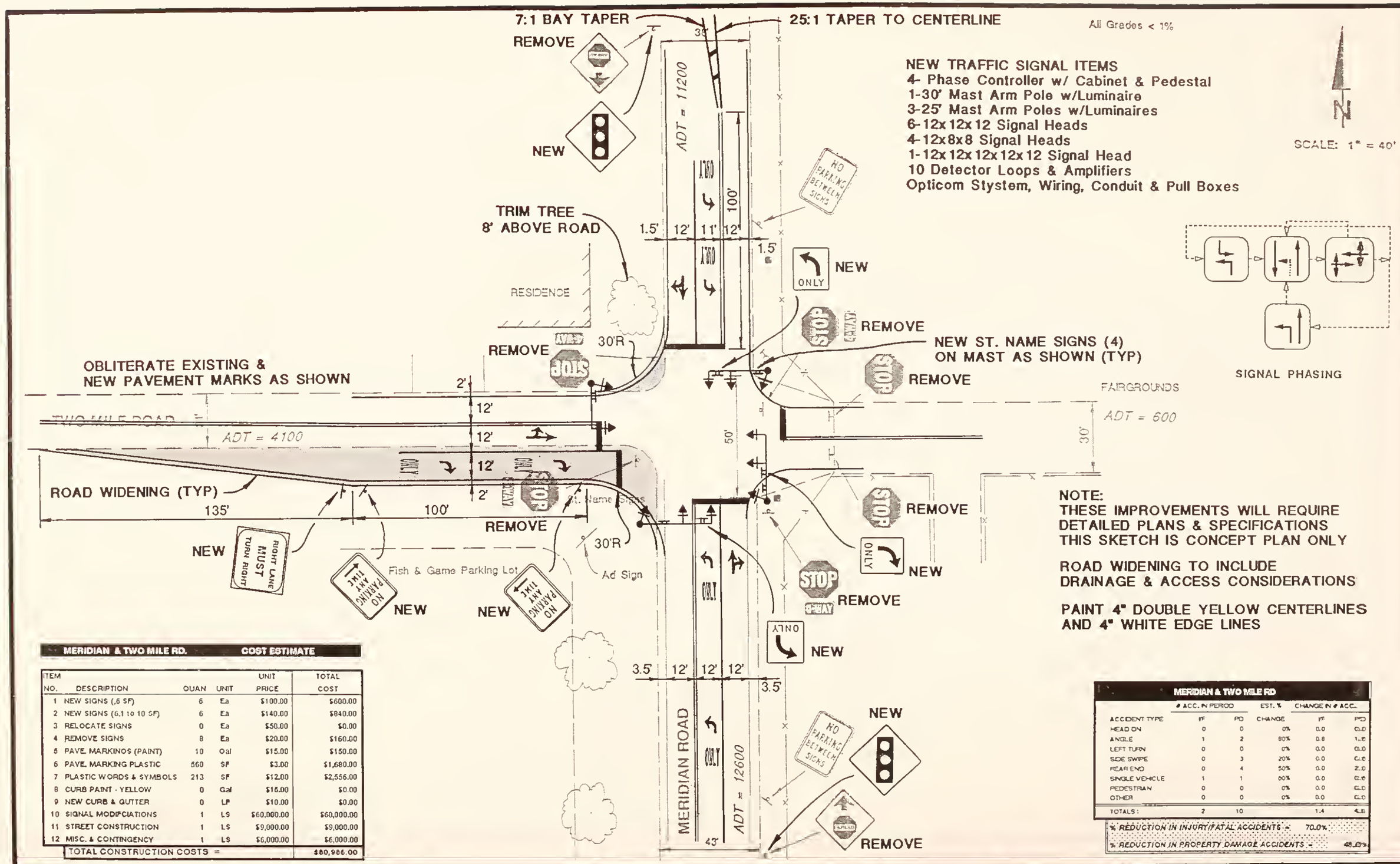
0 Peds

124 447 18

TRAFFIC MOVEMENTS 4:30 - 5:30 PM 9/30/92

MARVIN & ASSOCIATES Traffic, Transportation & Civil Engineers	1127 Alderson Ave. #204 Billings, MT 59102	MERIDIAN ROAD & TWO MILE ROAD	EXISTING CONDITIONS

SHEET 46



NOTE:
THESE IMPROVEMENTS WILL REQUIRE DETAILED PLANS & SPECIFICATIONS
THIS SKETCH IS CONCEPT PLAN ONLY

ROAD WIDENING TO INCLUDE DRAINAGE & ACCESS CONSIDERATIONS

PAINT 4" DOUBLE YELLOW CENTERLINES AND 4" WHITE EDGE LINES

MERIDIAN & TWO MILE RD. — COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (,6 SF)	6	Ea	$100.00	$600.00
2	NEW SIGNS (6.1 to 10 SF)	6	Ea	$140.00	$840.00
3	RELOCATE SIGNS	0	Ea	$50.00	$0.00
4	REMOVE SIGNS	8	Ea	$20.00	$160.00
5	PAVE. MARKINGS (PAINT)	10	Gal	$15.00	$150.00
6	PAVE. MARKING PLASTIC	560	SF	$3.00	$1,680.00
7	PLASTIC WORDS & SYMBOLS	213	SF	$12.00	$2,556.00
8	CURB PAINT - YELLOW	0	Gal	$15.00	$0.00
9	NEW CURB & GUTTER	0	LF	$10.00	$0.00
10	SIGNAL MODIFICATIONS	1	LS	$60,000.00	$60,000.00
11	STREET CONSTRUCTION	1	LS	$9,000.00	$9,000.00
12	MISC. & CONTINGENCY	1	LS	$6,000.00	$6,000.00
	TOTAL CONSTRUCTION COSTS =				$80,986.00

MERIDIAN & TWO MILE RD

ACCIDENT TYPE	# ACC. IN PERIOD FF	# ACC. IN PERIOD PD	EST. % CHANGE	CHANGE IN # ACC. FF	CHANGE IN # ACC. PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	1	2	80%	0.8	1.6
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	3	20%	0.0	0.6
REAR END	0	4	50%	0.0	2.0
SINGLE VEHICLE	1	1	80%	0.8	0.8
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	0	0%	0.0	0.0
TOTALS:	2	10		1.4	4.6
% REDUCTION IN INJURY/FATAL ACCIDENTS =			70.0%		
% REDUCTION IN PROPERTY DAMAGE ACCIDENTS =					46.0%

All Grades < 1%

Both Streets Have Parabolic X-section with Moderate Crown

SCALE: 1" = 40'

43' BC-BC

ADT = 700

RESIDENCE

STOP

St. Name Signs

12'

15' ALLEY

35' BC-BC

ADT = 1000

Gravel Parking

15' ALLEY

RESIDENCE

RESIDENCE

ALLEY

ADT = 1000

WASHINGTON STREET

1st AVE W

North

#1,3

#2,4

WASHINGTON

#5

#3,4 = Accident Reference Numbers

COLLISION DIAGRAM

FIRST AVENUE WEST

ADT = 1000

10'

STOP

Picnic Tables

Parking Lot

PTI PARKING ONLY

RESIDENCE

ALLEY

FIRST AVE W

12 28 1

6 Peds

2 Peds

1

29

4

2

28 WASHINGTON

4

1 Peds

1 Peds

9 17 25

TRAFFIC MOVEMENTS 2:00 - 3:00 PM 10/1/92

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

FIRST AVENUE WEST & WASHINGTON STREET

EXISTING CONDITIONS

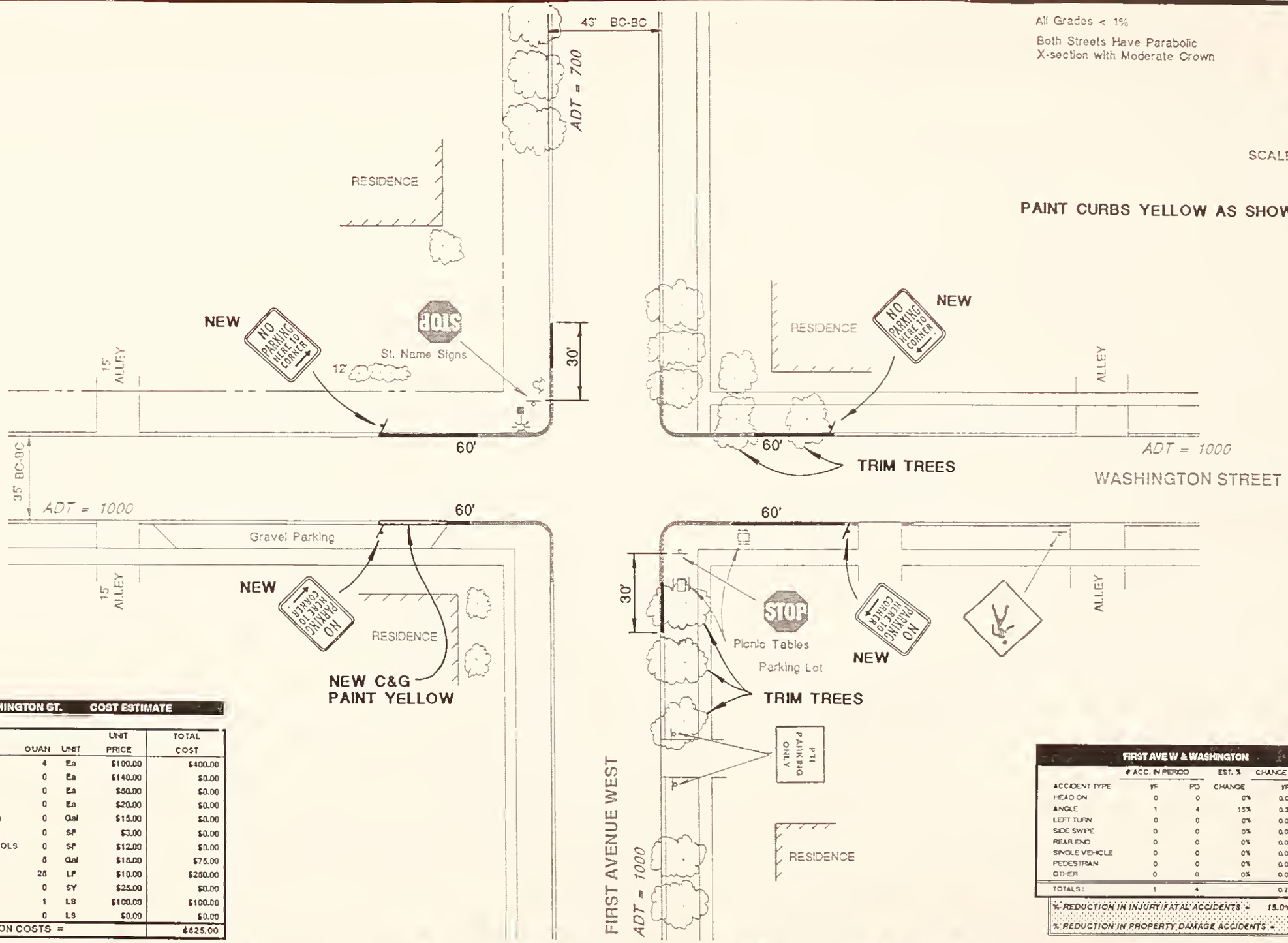
SHEET 48

All Grades < 1%

Both Streets Have Parabolic X-section with Moderate Crown

SCALE: 1" = 40'

PAINT CURBS YELLOW AS SHOWN



FIRST AVE. W & WASHINGTON ST. COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (,6 SF)	4	Ea	$100.00	$400.00
2	NEW SIGNS (6.1 to 10 SF)	0	Ea	$140.00	$0.00
3	RELOCATE SIGNS	0	Ea	$50.00	$0.00
4	REMOVE SIGNS	0	Ea	$20.00	$0.00
5	PAVE. MARKINGS (PAINT)	0	Gal	$15.00	$0.00
6	PAVE. MARKING PLASTIC	0	SF	$3.00	$0.00
7	PLASTIC WORDS & SYMBOLS	0	SF	$12.00	$0.00
8	CURB PAINT - YELLOW	5	Gal	$15.00	$75.00
9	NEW CURB & GUTTER	25	LF	$10.00	$250.00
10	NEW SIDEWALK	0	SY	$25.00	$0.00
11	TRIM TREES	1	LS	$100.00	$100.00
12	MISCELLANEOUS	0	LS	$0.00	$0.00
	TOTAL CONSTRUCTION COSTS =				$825.00

FIRST AVE W & WASHINGTON

	# ACC. IN PERIOD		EST. %	CHANGE IN # ACC.	
ACCIDENT TYPE	PF	PD	CHANGE	PF	PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	1	4	15%	0.2	0.6
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	0	0%	0.0	0.0
REAR END	0	0	0%	0.0	0.0
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	0	0%	0.0	0.0
TOTALS:	1	4		0.2	0.6
% REDUCTION IN INJURY/FATAL ACCIDENTS =				15.0%	
% REDUCTION IN PROPERTY DAMAGE ACCIDENTS =					15.0%

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers
1127 Alderson Ave. #204
Billings, MT 59102

FIRST AVENUE WEST & WASHINGTON STREET

SHORT TERM IMPROVEMENTS

All Gardes < 1%

SCALE: 1" = 40'

31'

ADT = 450

RESIDENCE

Garage

ALLEY

St. Name Signs

RESIDENCE

ALLEY

35'

ADT = 850

35' BC-BC

ADT = 900

SEVENTH STREET

ALLEY

RESIDENCE

6th AVE W

North

7th ST

#1,2,3, 4,5

#3,4 = Accident Reference Numbers

COLLISION DIAGRAM

SIXTH AVENUE WEST

ADT = 350

7:00 AM to 6:00 PM

SPEED LIMIT 15

SCHOOL

RESIDENCE

SIXTH AVE. W

0 Peds

40 Peds

SEVENTH ST

13 Peds

0 Peds

	4	5	4		
	3			7	
	39			15	
	1			1	
	4	11	3		

TRAFFIC MOVEMENTS 8:20 - 9:20 AM 10/1/92

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

SIXTH AVENUE WEST & SEVENTH STREET

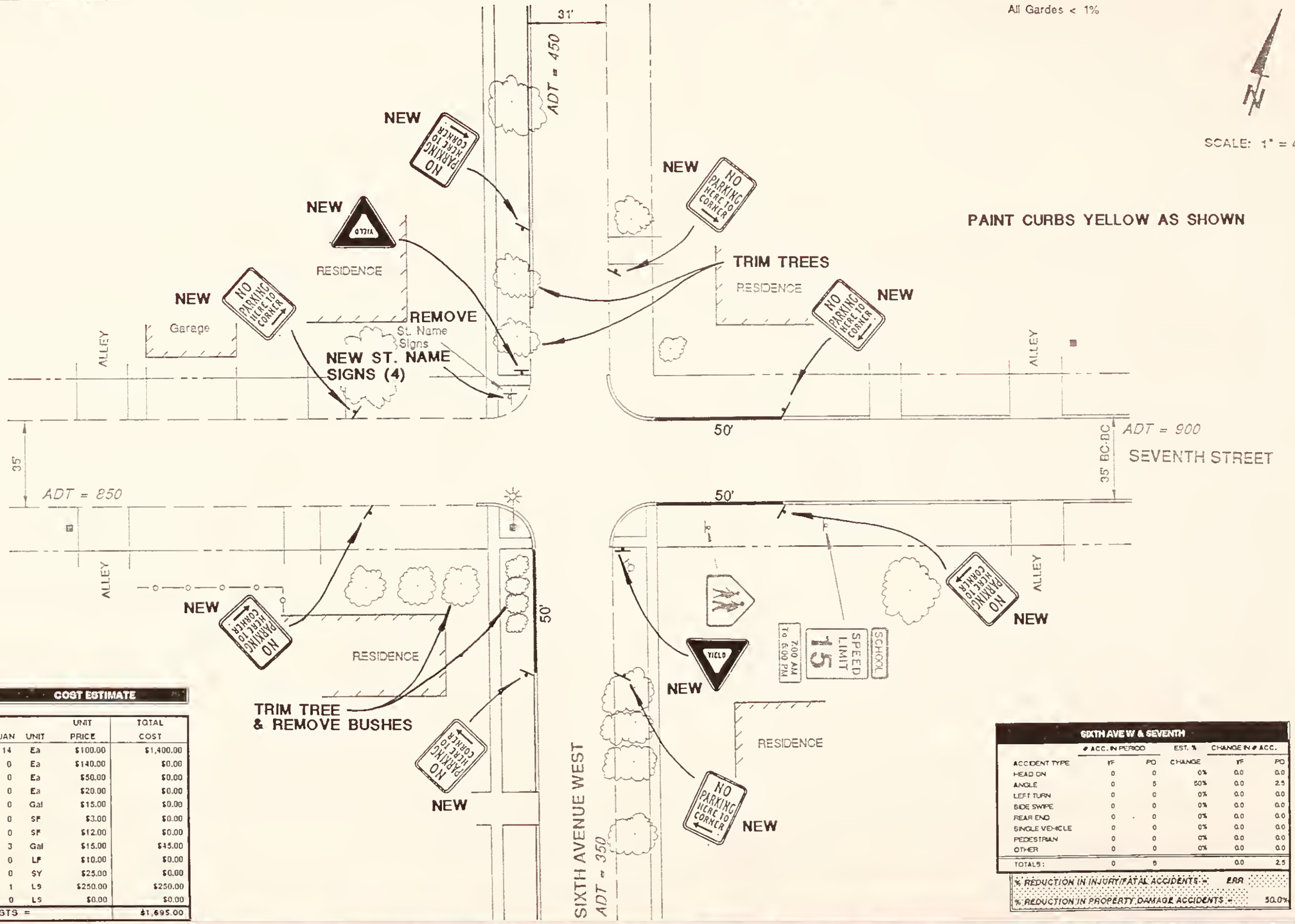
EXISTING CONDITIONS

SHEET 50

All Gardes < 1%

SCALE: 1" = 40'

PAINT CURBS YELLOW AS SHOWN



SIXTH AVE. & SEVENTH ST. — COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (,6 SF)	14	Ea	$100.00	$1,400.00
2	NEW SIGNS (6.1 to 10 SF)	0	Ea	$140.00	$0.00
3	RELOCATE SIGNS	0	Ea	$50.00	$0.00
4	REMOVE SIONS	0	Ea	$20.00	$0.00
5	PAVE. MARKINGS (PAINT)	0	Gal	$15.00	$0.00
6	PAVE. MARKING PLASTIC	0	SF	$3.00	$0.00
7	PLASTIC WORDS & SYMBOLS	0	SF	$12.00	$0.00
8	CURB PAINT - YELLOW	3	Gal	$15.00	$45.00
9	NEW CURB & GUTTER	0	LF	$10.00	$0.00
10	NEW SIDEWALK	0	SY	$25.00	$0.00
11	TRIM TREES	1	LS	$250.00	$250.00
12	MISCELLANEOUS	0	LS	$0.00	$0.00
	TOTAL CONSTRUCTION COSTS =				$1,695.00

SIXTH AVE W & SEVENTH

ACCIDENT TYPE	# ACC. IN PERIOD IF	# ACC. IN PERIOD PD	EST. % CHANGE	CHANGE IN # ACC. IF	CHANGE IN # ACC. PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	0	5	50%	0.0	2.5
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	0	0%	0.0	0.0
REAR END	0	0	0%	0.0	0.0
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	0	0	0%	0.0	0.0
TOTALS:	0	5		0.0	2.5

% REDUCTION IN INJURY/FATAL ACCIDENTS = ERR

% REDUCTION IN PROPERTY DAMAGE ACCIDENTS = 50.0%

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers
1127 Alderson Ave. #204
Billings, MT 59102

SIXTH AVENUE WEST & SEVENTH STREET

SHORT TERM IMPROVEMENTS

SHEET 51

SIGNAL INFORMATION

Controller - Tranconex Model 390

Fully Actuated

Ped Indications on Each Leg Except West X-ing of Center

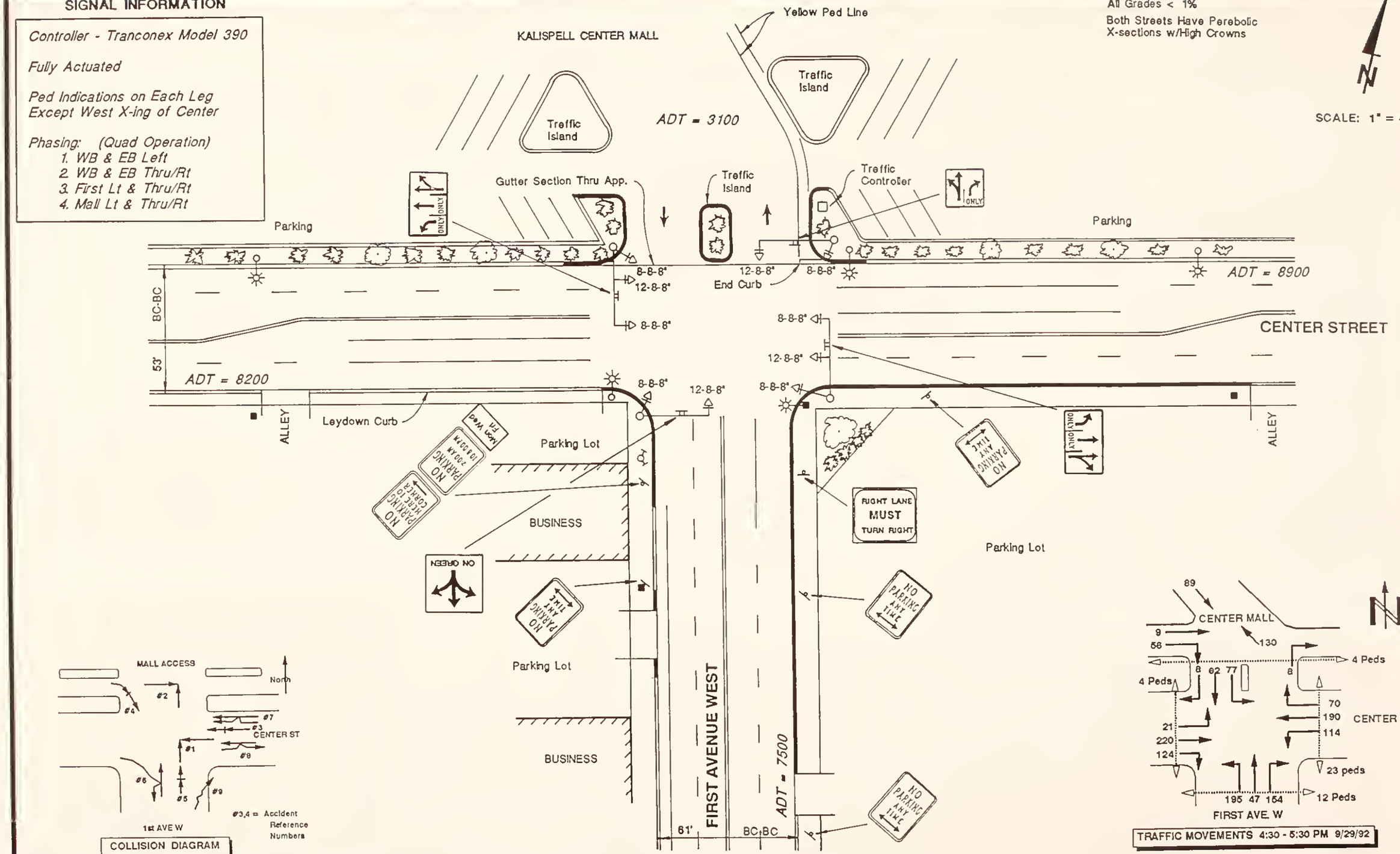
Phasing: (Quad Operation)

1. *WB & EB Left*
2. *WB & EB Thru/Rt*
3. *First Lt & Thru/Rt*
4. *Mall Lt & Thru/Rt*

All Grades < 1%

Both Streets Have Perebolic X-sections w/High Crowns

SCALE: 1" = 40'



COLLISION DIAGRAM

TRAFFIC MOVEMENTS 4:30 - 5:30 PM 9/29/92

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers

1127 Alderson Ave. #204
Billings, MT 59102

FIRST AVENUE WEST & CENTER STREET

EXISTING CONDITIONS

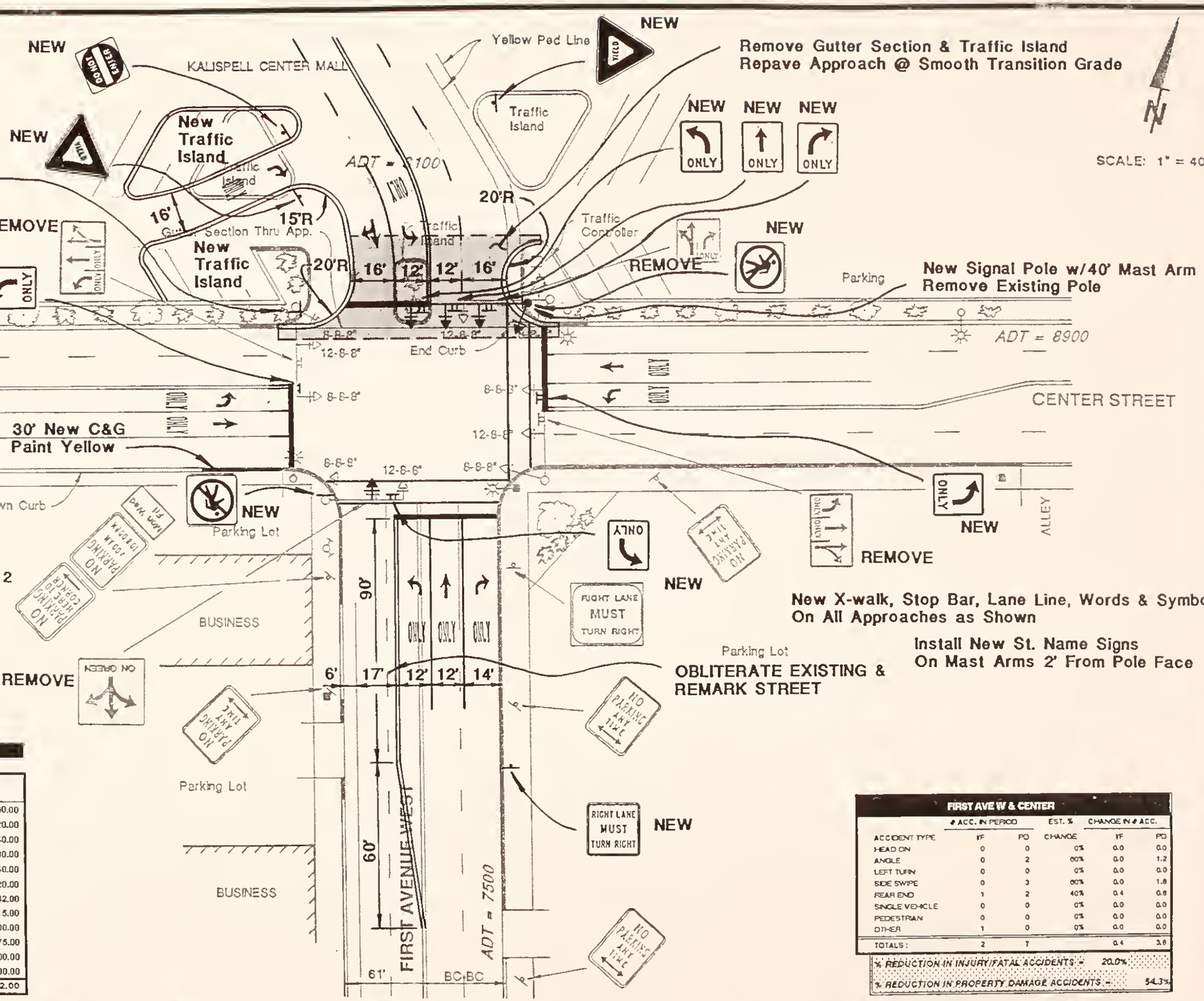
SIGNAL INFORMATION

Controller - Tranconex Model 390

Fully Actuated

Ped Indications on Each Leg Except West X-ing of Center

Phasing: (Quad Operation)
1. *WB & EB Left*
2. *WB & EB Thru/Rt*
3. *First Lt & Thru/Rt*
4. *Mall Lt & Thru/Rt*



SIGNAL IMPROVEMENTS:

New Pole with 40' Mast
Install New Loop Detectors as Required
Replace All Existing 12x8x8 Heads w/12x12x12
New Signal Heads as Shown
Rewire Poles and Cabinet as Required
Change Phasing to Full Quad
w/Oppossing Lefts & Overlaps

FIRST AVE. W & CENTER ST. COST ESTIMATE

ITEM NO.	DESCRIPTION	QUAN	UNIT	UNIT PRICE	TOTAL COST
1	NEW SIGNS (<6 SF)	6	Ea	$100.00	$600.00
2	NEW SIGNS (6.1 TO 10 SF)	8	Ea	$140.00	$1,120.00
3	RELOCATE SIGNS	0	Ea	$50.00	$0.00
4	REMOVE SIGNS	4	Ea	$20.00	$80.00
5	PAVE. MARKINGS (PAINT)	0	Gal	$15.00	$0.00
6	PAVE. MARKING PLASTIC	740	SF	$3.00	$2,220.00
7	PLASTIC WORDS & SYMBOLS	236	SF	$12.00	$2,832.00
8	CURB PAINT - YELLOW	1	Gal	$15.00	$15.00
9	NEW CURB & GUTTER	440	LF	$10.00	$4,400.00
10	NEW SIDEWALK	11	SY	$25.00	$275.00
11	SIGNAL MODIFICATIONS	1	LS	$25,000.00	$25,000.00
12	LANDSCAPING & MISC	1	LS	$8,000.00	$8,000.00
	TOTAL CONSTRUCTION COSTS =				$44,542.00

FIRST AVE W & CENTER

ACCIDENT TYPE	# ACC. IN PERIOD IF	# ACC. IN PERIOD PD	EST. % CHANGE	CHANGE IN # ACC. IF	CHANGE IN # ACC. PD
HEAD ON	0	0	0%	0.0	0.0
ANGLE	0	2	60%	0.0	1.2
LEFT TURN	0	0	0%	0.0	0.0
SIDE SWIPE	0	3	60%	0.0	1.8
REAR END	1	2	40%	0.4	0.8
SINGLE VEHICLE	0	0	0%	0.0	0.0
PEDESTRIAN	0	0	0%	0.0	0.0
OTHER	1	0	0%	0.0	0.0
TOTALS:	2	7		0.4	3.8
% REDUCTION IN INJURY/FATAL ACCIDENTS =				20.0%	
% REDUCTION IN PROPERTY DAMAGE ACCIDENTS =					54.3%

MARVIN & ASSOCIATES
Traffic, Transportation & Civil Engineers
1127 Alderson Ave. #204
Billings, MT 59102

FIRST AVENUE WEST & CENTER STREET

SHORT TERM IMPROVEMENTS